*"Does art-science help us understand the world*
*- and make the world understood?"*

# PUBLIC ENGAGEMENT WITH CLIMATE CHANGE THROUGH VISUAL ART:

## An Experiment with Art-Science

**Rhian N Field**

**2017**

This thesis is submitted for
the degree in Doctorate of Philosophy
at Aberystwyth University

Department of Geography and Earth Sciences
Aberystwyth University, WALES, U.K.

This work is dedicated to

my Mother and Father, both WWII RAF Veterans,

and my dear family.

Word count 84,238

# Contents

# List of Figures:

## List of Tables:

## ACKNOWLEDGEMENTS

Acknowledgements are made to organisations and personnel who helped make this research possible, especially the Arts and Humanities Research Council (AHRC), Collaborative Doctoral Award. Acknowledgements are also made to the organisations and associates who accommodated the field research and assisted with data collection activities. They include Mr Paul Davies A.M for the National Assembly for Wales, Cardiff, Mr Mike Davies at the Torch Theatre, Milford Haven, deputy head teacher Mr Mike Davies at Ysgol Preseli, Crymych and teacher Miss Anwen Jones at Ysgol Bro Hyddgen, Machynlleth. In addition, this PhD research project has benefited from the guidance and encouragement of Professor Mike Woods and Professor Mark Macklin of Aberystwyth University. Gratitude is extended also to the public for their humble participation and valuable contribution to new knowledge and understanding.



## ABSTRACT

Art has a potentially influential part to play in science communication, assisting in the process of making information more accessible and more effective. It supports education, serves as a universal language and can help us imagine and hypothesize. However, beyond the practical application of art as visual illustrator, there is something more mysterious and the possibility of a potential yet un-tapped. Art has a reputation for influencing human emotions and behaviour, although the exact mechanics of this process is presently unknown. An effective collaboration between artists and scientists might depend upon a more prescriptive approach and a meeting of minds towards clear objectives. Artists might be inclined to take up such a challenge but to what degree would scientists share their conviction? This research explores whether art and science can collaborate effectively to influence behaviour in the environment towards climate change adaptation and how this might be approached. As part of an empirical mixed method approach to field research, an experimental test-kit was developed by science-trained practicing artist Rhian Field. Experiments were set up in a selection of locations in Wales during 2014 and 2015, to explore the opportunities for the role of visual art in the face of climate change impacts and the need for adaptation. This field research, underpinned by knowledge from a broad range of disciplines, examines the factors that potentially influence public engagement with visual art within a context of climate change, and considers the opportunity for art-science within climate change adaptation.

# PREFACE

This is a personal note by the author intended to lay foundations for an art-science way of thinking, a mind-set of salience and latent opportunity. Like the miraculous dormant seed or egg, waiting many years for rain so it can come to life again, art is the miracle of humankind.

*"I wasn't even eighteen yet, and it was time to leave all those artistic dreams behind me, just like I had been influenced to think in school, there was no place for it, realistically, when it came to earning a living and paying my way (or so I believed). My father was right of course; to achieve success within the world of art one needs to be one (or both) of two things, - that is a genius, or someone with the right contacts. It would have to be a choice between either the arts or the sciences, and the sciences were way ahead when it came to being taken seriously, during my school days. Although there was one further drawback for me…girls were not encouraged and supported to take the science route at that time. So, I followed a career in business.*

*Throughout my working life I have been called to apply my artistic skills within employment. I could expect as a return on my investment of time, effort and imagination, an expression of awe, a pat on the back by the department heads, a box of chocolates and a "thank you", or simply a sense of personal satisfaction. Whatever the return, it never seemed to justify the effort somehow, and I was often left with a feeling of regret for having agreed to get involved in the first place. Other people made money from my artistic skills…I just kept my job. My point is that artistic skill is often undervalued, but always in great demand, and this is my opportunity to remind the world.*

*Several years on, having decided to change career and follow my passion, I enrolled on a Coastal and Marine Environment Science degree assuming unconsciously that it would divert me further from any serious artistic pursuit. I could not have been more mistaken. Within the first week of the degree course, I arrived a few minutes late to a wild, outdoor location, for our first field trip. I was promptly handed a clipboard and sheet of paper so that as a science student, I could survey the diverse ecological habitats of the estuary creek – winding channels, purslane, sand banks, grassland and ancient*

*woodlands in the distance - and draw them as a large landscape. I happily and swiftly set about the task with a sense of relief, with thoughts of "this will be relatively easy", only to find other students struggling and trying to persuade me to do their drawings for them.*

*But most importantly, while standing there, trying to make sense of the landscape before us, applying artistic principles of observation taught to me as a child, (and how we must practise seeing beyond looking), the entomologist lecturer was providing a scientific explanation of how these different features before us link up to provide habitat for the rich diversity of fauna and flora which populate it. The new science knowledge meant not only could my artist's eye see…but I now understood, and my drawing was richer for it.*

*And that's where it all began for me. This relationship had previously eluded me, and yet it was obvious…the artist and the scientist in me were involved in the perfect symbiotic affair."*

# CHAPTER 1. INTRODUCTION

## 1.1. Context

This thesis has been developed as one of three AHRC Collaborative Doctoral Award funded PhD studentships, which explore the production and audience engagement of art-science projects. Focussed on the UNESCO designated Dyfi Biosphere, Wales, the original proposal for this PhD, written by Professor Deborah Dixon, was titled "*Art-Science Collaborations and Community Engagement with the Environment in the Dyfi Biosphere*" with the aim of exploring the role of art in communicating scientific knowledge about the environment, to local communities, and informing the ways in which these communities engage with the environment and planning for sustainable development.

The author has approached the project with the perspective of a science-trained practicing artist, having conducted independent research investigating and experimenting with the potential of art-science in the three years previous. She also brings skills and experience gained in retail, buying and entrepreneurial activities within the high-end service industry.

The first objective was to examine all the evidence and knowledge that appears to be linked to understanding the relevance of art to humankind, resulting in a multidisciplinary study. Whilst this approach has proved enormously challenging, it has brought together wide-ranging viewpoints to produce a holistic and unique perspective on the opportunities for art-science within public engagement and climate change adaptation. Although it has been her mission to avoid making biased assumptions, the author's passion and conviction for the value of visual art, and its potential influence within science, and the survival of humankind, has helped with the momentum to complete this study. The first steps were to examine the debate around the need for public engagement in the environment.

Since Constable's expressions on canvas of the physical and cultural landscape in the 18$^{th}$-19$^{th}$ centuries, empirical science has progressed rapidly (Rees, 1976) and collaborations between geographers and artists have grown exponentially (Tolia-Kelly, 2012). There has been a drive towards participatory research, impact and engagement, where the audience becomes the site of meaning-making. Geographical research is involving art towards improving inclusivity and equality. Chapter 2; 2.6. examines art's re-introduction to geography, acknowledging past and

current perspectives on collaboration. Focussing on collaboration between art, science and geography in the visual form, there is a brief overview of visual art within the context of human crisis, that is extreme weather events, wartime Britain and climate change, in chapter 5.

Public engagement with the concept of climate change and the need to adapt remains unclear in that whilst the public articulate a degree of acceptance of the crisis, it is difficult to gauge how they truly feel about it, day-to-day. For there to be a shift in behaviour which would contribute to climate change impact mitigation, it would be reasonable to suggest that the public need to demonstrate a motivation to act. This is where potential for art-science collaboration might be instrumental. As discussed in Chapter 3, art has played a critical role in the cultivation, development and preservation of communities since early man, and evidence of some of the earliest artistic expressions as communication is witnessed in the Cueva de las Manos, Argentina.

Although there has always been a relationship between art and exploration, there is a growing interest in the use of art as a means of communicating science knowledge (Humboldt, (1800-1949); Kern, 1849; Mead, 1959; Curtis, *et al*, 2012; Born & Barry, 2012; Ruddock, *et al*, 2013). When drawing and painting were the only methods available for creating visual documentation of new discoveries, artists played a central role in geographical exploration. The legacy of expeditionary art offers opportunities for building stronger linkages between art and geography (Balm, 2010). Furthermore, art fulfils a function beyond illustration and record-making, by influencing a shift in beliefs and attitudes. It might hold the potential for broadening the horizons of public understanding, producing informed decisions on action.

In considering whether an art-science function has a place in the Anthropocene, it could be argued that in today's relatively autonomous and free-thinking society, government can no longer rely upon issuing directions (orders) and publishing impactful messages as a means of influencing the public's behaviour, as it might have done as recently as World War II posters displayed in public places were designed to evoke and provoke a code of behaviour, in the face of impending security threats and diminishing resources. Examples of World War II posters are explored as the art of human crisis in Chapter 5.

Communities relied upon the government to protect, guide and instruct them, largely without questioning its strategy or methods. For most people, there was a sense of unity and a common goal.

Since then, there has been a cultural shift towards a more questioning society as information is more freely available, and the public have the confidence to form their own opinions. In addition, during the past couple of decades, electronic communication and social networking will have had a humanizing influence on us, fostering the emergence of a "*collective intelligence*" (Levy and Bononno, 1999), and a meeting of (public) minds. Environmental behaviour will become self-shaping, as new social norms are established. On the other hand, there is a potential threat to mutual regard by sustained and rapid migration, and growing population diversity, which leads to a loss of trust and social co-operation (Collier, 2013). In addition, an analysis of recent field data (presented in subsequent chapters) indicates that as far as climate change is concerned, the public remain confused and mistrusting. Even if there was a common goal, any attempt to influence the public would be extremely challenging and requires a more complex approach than would have been necessary some fifty years ago, or more.

By the late 1950s, government believed that Britain could be modernised by incremental change and enlightened experiments in state intervention. They were mistaken; they had been drifting all the time toward the rapids (Addison, (2010)), producing powerful currents of changing social values and behaviour. As Addison points out, the British had given up most of their liberties for the duration of the war and it remained to be seen how far they would recover them when peace returned. As well as a shift from a predominantly working-class society to pre-dominantly middle-class one, Britain was subject to rising feminism, multiculturalism and a more liberal, individualist society. However, it could be that the overriding factor in the government's inability to coerce the public by similar means as were deployed during World War II, could be the erosion of British national identity.

Considering this realisation, the impact of art as actor within such a necessary and complex approach (towards a common goal), is worth revisiting and re-evaluating. The experimental methods introduced here respond to the need to further our understanding of how the public relate to life and other people, through a form of visual art. It could be said that the weakness of this approach is that the relationship between art and the human brain cannot be fully explained; however, this also serves as its strength. If it were not so, we might eventually exhaust its influence and render it redundant. As artist and sculptor Auguste Rodin (1840-1917) said, *"Great works of art… make us understand that there is something else that one cannot know".*

## 1.2. Climate Change and Pollution

Understanding public perceptions of the need for climate change adaptation in Wales has become an increasingly important imperative in recent years. In response to the flooding events of 2013/2014, a representative survey was funded through the Climate Change Consortium of Wales (C3W) in partnership with Aberystwyth University. The main aims of the survey were to examine people's views regarding the reality of and human contribution to climate change, their concerns about the impacts of climate change, perspectives on climate change adaptation, and attitudes towards policy and behaviour change (Capstick, *et al*. 2015). The findings demonstrate that levels of belief in the occurrence of climate change and its anthropogenic component are close to those high levels seen in 2005, while scepticism has correspondingly receded. The study also acknowledges that the challenges faced by communicators seeking to engage the public around climate impacts are significant.

More than forty years have passed since 1972 when the input of particulates and chemicals to the atmosphere was so enormous that scientists recognised the atmosphere could no longer cleanse itself. Human population since the industrial revolution had exploded, spread across all land masses, and with it a proliferation of industry, transportation and agriculture, which was so massive and continuous that the limitations of the planet earth began to be realised, resulting in climate change. However, more than four decades ago, the most difficult questions to answer were precisely what changes in climate were occurring (if any), and what were the specific causes (Gates, 1972). This is what they were claiming at the time:

> We really do not know what is going on. We do not know positively the *cause* and what is *effect*. All we believe is that something may be happening. There may be a warming trend because of continuing increase of carbon dioxide concentration in the atmosphere and there may be a cooling trend because of increased turbidity caused by dustiness and pollution generally. The really frightening thing is that something man-made may indeed be affecting the global system of land, sea, and air which will result in a worldwide change of climate (Gates, 1972; pp.151-152).

The suggestion was that as the planet becomes more and more crowded with human population, all the ingenuity, skill, and knowledge man can muster must be used for his management of the earth's ecosystems, to avoid pandemics of disease, famine through crop failure, catastrophic climate change, resource depletion, and social breakdown. Our knowledge status as well as our ability to respond to changing events within climate and life, in a sensible, rational manner, was viewed as critical (Gates, 1972).

The challenge of responding to changing events within climate and life (Gates, 1972) could be described as a complex one. Social challenges are emergent because their properties, or perhaps characteristics, arise from the interaction of many parts. In complex systems, new information is constantly being generated which gives rise to adaptive behaviour, and are distinct by nature from technical challenges (Hassan, 2014). Whilst Gates (1972) saw more than four decades ago that it was time for a sensible, rational response to climate change, a great deal of time has since been invested into making that happen, or at least understanding better why the task of getting the public to respond is not easily achieved.

Our values, assumptions and prejudices can take on lives of their own, gaining authority as they are shared, dividing people in their wake. Marshall (2014) examines why our brains are wired to ignore climate change, how we follow the people around us and use uncertainty (continually changing science information for example) as a justification for inaction, choosing what to ignore.

Another view of this complex challenge is that it is an environmental, cultural and political phenomenon which is reshaping the way we think about ourselves, our societies and humanity's place on Earth (Hulme, 2013). This presents a problem for policy design. The media are central to the ways in which we apprehend climate change risks and it performs a powerful function in its understanding. As communication is so important, we need to consider the languages, images and signs that are used as well as the motives and goals of the media performing this function. Apart from communication, there is also the question of who governs climate change, when we seek to govern in different ways. And what potential exists for the public to influence leadership? If indeed there is potential in art, as collaborator with environmental science for climate change mitigation and adaptation, then it ought to be better understood and used without delay. If, however, we find there is only marginal benefit to be derived, then let us focus our attention and resources on alternative investigations.

With art being a somewhat slippery subject, difficult to define, analyse and unravel, so to speak, the task of investigation looms large, and therefore the decided approach from the onset was to cast the net wide within the academic arena, not wanting to pre-empt where a better understanding might be found, nor narrow the field of view, to begin with. For this purpose, an array of methods was explored which would provide a broad set of data and help make the research accessible to a wide audience. Both quantitative and qualitative data were collected, and visuals used in such a way as to gather both immediate, instinctive responses, as well as

more considered and thoughtful ones. For example, the Climate Change Image Poll consisting of 10 visuals was designed to be a two minute exercise and capture instant impact. It also encouraged particicpation by those with limited time or confidence. In contrast, section five of the Experimental test-kit of paintings required the participant to first interpret the images and then reflect on their emotions. This task took around ten minutes to complete. We cannot hope to know what any one individual is thinking, but we can observe how they engage with visuals, within a context, looking for evidence of consistencies and patterns that might shed light on art's unique contribution. Afterall, art has no value without the viewer.

## 1.4. Motivations and Background

In the quest for progress with climate change adaptation, ideas are being explored by contributors from many different areas of expertise and academic disciplines, around the world. It makes sense to *"welcome all hands to the pumps"*, so to speak, and make change happen, using whatever ideas and expertise there is available, drawing on both the sciences and the arts to mastermind a joined-up approach to solving, or at least mitigating the crisis as it is unfolding. The author brings contributions from numerous areas of study and observation, as well as life and work experience to this research. Additionally, she is ideally positioned to explore art-science, having a keen interest in both visual art and environmental science, plus first-hand experience of what she would claim is a "*symbiotic*" relationship.

Rhian Field spent many years working in the commercial environment and business management before changing direction to study for a degree in Coastal and Marine Environment Studies. Her environmental science interests, together with self-taught artistic skills led her to explore the role of art in engaging people with the natural environment, and she has had several successful exhibitions in public spaces, in collaboration with the National Assembly for Wales, Pembrokeshire Coast National Park Authority, RSPB Cymru, and the RSPB Future of the Atlantic Marine Environment (F.A.M.E.) bird tracking project. Her underwater oil paintings have typically sold to marine ecologist divers and those involved in environmental work. Further information is available at www.rhianfield-art.co.uk. A personal interest in the relationship between visual art and environmental science attracted Rhian to this PhD research project which is sponsored by the AHRC Doctoral Awards Programme. The opportunity provided by the AHRC Doctoral Award has enabled an exploration of the potential for art-science as an anthropological game-changer, within climate change adaptation. The author brings added value to the project, on the ground, in the form of skills and experience

which are considered useful to the research project, and which help inform the research findings:

## 1.5. Skills, training and experience

Table 1.1. Author's skills, training and experience

| |
|---|
| Business and commercial experience: |
| • Market research and an understanding of the importance of establishing consumer demand; how competing bodies impact on consumer decision-making. |
| • An appreciation of the importance of visual impact within retail, service industry and marketing activities in general. |
| • Understanding consumer peculiarities, unpredictable responses and elasticity of demand within the market place. |
| • Applied experience of communication, monitoring, evaluating and strategic planning; exploring cause and effect. |
| |
| Coastal and Marine Environment Studies. |
| • Both academic and practical experience of environmental field surveys, data collection, data analysis, evaluation and interpretation. |
| • Drawing in the field – diagrams, illustrations etc. |
| • Experience of experimental and observational work, exploring cause and effect. |
| • Presenting to both public and academic audience. |
| |
| Artistic practice and promotion. |
| • Ability to think independently and act creatively, identifying ideas and possibilities which are 'outside the box'. |
| • Commercial application in the form of graphic design, for training communication (cartoons), marketing and advertising, textiles, print designs, point of sale material and corporate image logos. |
| • Experience of project planning for independent body of work as well as commissions. |
| • Practice with the development of ideas, themes and narratives and experimentation; construction of materials. |
| • Exercised in empathising, imagining, and philosophical exploration. |
| • Ability to relate artistic works to established science knowledge; collaboration with government and non-government environmental organisations. |
| • Marketing and profile-raising, organising, managing and strategizing within aims to promote the project. |

Business skills and experience provide a footing for understanding how the public are impacted, influenced and sometimes manipulated to behave. Although there exists an element of unpredictability within any marketing campaign when it comes to knowing exactly how a consumer will respond, sound monitoring and evaluation can help to determine effectiveness and future opportunities. Additionally, an understanding of coastal systems and coastal management helps with a sympathetic perspective on the implications of climate change. The conveyance (or indeed sharing) of this understanding, via presentations which target the public audience, is both challenging and critical to progress within climate change adaptation. Overall, the author's range of artistic skills and applied experience brings some authority to the project, and underpins the strategy which was developed for both literary and practical investigations into the potential of art-science collaboration.

## 1.6. Aims & Objectives

The aims were to explore the role of visual art within the communication science and climate change impacts, how it helps us understand the public's relationship with the concept of climate change, and what scope there is for art-science, to motivate humankind. It was anticipated that the field research methods would provide new insights into how the public relate to climate change via an artistic medium. Participants were also asked to relate to both local and global impacts of climate change.

It is hoped that the field research will contribute to our understanding of the potential benefits of art-science collaboration, within a context of climate change adaptation. Additionally, it is believed that new insights gained from the field research might be built upon with further, in-depth research and applied as a practical approach to climate change adaptation public policy programmes.

## 1.7. Research Questions

This research investigates art-science collaboration and seeks to answer the following questions:

1. How does the public engage with visual art in the form of paintings and drawings, within a science context of climate change impacts?

2. How might public engagement with visual art within a context of climate change hold potential for behaviour change and adaptation?

The main aim of the research was to understand how the public engage with visual art within a science context of climate change impacts, and explore how art-science in collaboration might hold potential for behaviour change and climate change adaptation. Field research investigated how the public engage with representations of environmental scenes and scientific knowledge, through the medium of visual art, i.e. paintings and drawings. Attention was given to the factors that influence the impact of visuals on individual personalities, using a set of original paintings designed for the experiment. Furthermore, by encouraging them to participate in making their own drawings, the investigation sought to gain an understanding of how the public engage with climate change currently, and what they consider to be the opportunity for visual art within adaptation.

The results of the mixed method empirical field research provide an insight into how the public generally view art, science, climate change, and what ideas they have regarding how best to communicate the climate change science message to the community. Methods included a test-kit of paintings in an exhibition with accompanying question sheets, an image poll, questionnaires, drawings by the public as well as interviews and discussions with both individuals and groups.

## 1.8. Thesis Outline

The thesis structure consists of eight main chapters summarised below.

**Chapter 1: Introduction**

Chapter 1 explains the context within which investigations has been carried out, why this research is both topical and necessary. It provides background information about the author, her motivations and the skills she brings to the table, and why she might offer an unique perspective on the subject of art-science collaboration. This chapter also states the aims and objectives, followed by the key research questions which are the main focus of the research.

The literature reviews are divided into two areas of enquiry:

**Chapter 2: Art, Science and Geography**.

This chapter examines the activity and dialogue surrounding art-science collaboration, exploring the beliefs and understandings around art in general and calling upon knowledge from several disciplines. It considers the debates surrounding art, science and geography,

looking at the difficulties (and requirements) for assessment and evaluation of arts projects, as well as acknowledging the challenge of communicating climate change in the 21st century. In the second half of the chapter there is a focus on geography and art, collaboration in practice and an overview of support for art-science collaboration.

**Chapter 3: Art and Human Behaviour**.

This chapter returns to the basics of human interaction with art, reviewing knowledge gained in previous specialist studies and attempting to better understand what might influence the impact of artistic visuals on humankind and how critical it might be to our survival.

The review returns to some of the basic scientific discoveries and theories surrounding the relationship between art and the human brain, and what difference that might make to our understanding of science. It also acknowledges medieval perspectives on light and rhythm relating them to idea and reason. Other themes discussed are culture, language, diversity, personality types and corresponding triggers for motivation and action, like-mindedness and perception. This chapter helped inform the methodology for the experimental field research.

**Chapter 4: Methodology.**

This chapter introduces the methodology, both conventional and experimental, for field research designed to explore and respond to the key research questions identified in Chapter 1. It explains the rationale, context, impetus and positionality of the researcher and then provides details of the planning and design for the mixed method field research activities. Finally, in relation to the analysis and interpretation of quantitative and qualitative data, there is a review of approaches to analysing images that have been adopted in the past.

**Chapter 5: The Art of Human Crisis.**

This chapter explores samples of artistic images, sourced online, which relate to three periods of extreme events and human crisis, to better understand art's role within the public domain at times of stress, and to help debate it's potential and opportunity going forward. It looks at three periods; Extreme weather events, World War II posters, and climate change visuals. The discussion is the perspective of the author as artist/researcher, and relates to the images' scope for engaging the public. It considers how the consumption of these images from three periods might have evolved, and why it is relevant today.

**Chapter 6: Public engagement with art-science**

Chapter 6 responds to the first of the two key research questions: How does the public engage with visual art in the form of paintings and drawings, within a science context of climate change impacts? It presents findings from the analysis and interpretation of quantitative and qualitative data, and discusses the different ways in which the public have engaged with art-science within the field research activities.

**Chapter 7: The opportunity for art-science**

Chapter 7 responds to the second of the two key research questions: How might public engagement with visual art within a context of climate change hold potential for behaviour change and adaptation? It discusses how the findings presented in Chapter 6 might be developed towards progress within behaviour change in the environment and climate change adaptation.

**Chapter 8; Conclusion.**

This chapter gives an overview of the research, pinpointing knowledge considered pertinent to the quest to understand the public's relationship with the concept of climate change, and the scope for art-science as a motivator for change. It concludes on the outcomes and potential value of the experimental field research undertaken, reflects on the process and proposes areas for future research.

# CHAPTER 2: Art, Science and Geography

## 2.1. Introduction

In recent years, there has been a huge surge of interest in affect and emotion. Scholars want to discover how people are emotionally moved, and to understand embodied social action, feelings and passions. How do social formations motivate people? How do roller coasters of contempt, patriotism, hate and euphoria power public life (Wetherell, 2012)? Furthermore, how does this powering of public life translate into decision-making and action? Presuming that art (and creative practices) are inherent in our evolutionary make-up as human beings, what role does art play in affecting society, within the natural environment and the need for climate change adaptation? The author, as scientist-artist, has approached the literature review in two parts, by taking an overview of activity and dialogue surrounding art-science collaboration in this chapter, and then by exploring the beliefs and understandings around art, and its influence on human behaviour in Chapter 3. The multi-disciplinary review calls upon knowledge from a wide range of research fields including art, science, economics, communications and geography, to understand art's relationship with humankind, and without boundaries.

This chapter looks at the debates that surround art, science and geography, including the emergence of new connections made between disciplines. It also examines the basis for bringing art into the science territory, and how arts-projects have been assessed in the past in terms of their usefulness and value. Furthermore, it responds to an imperative to engage the public in the subject of climate change and the need for adaptation, within the environment. The challenge seems to be one of convincing and justifying, and yet many such projects have already taken place around the world, most of which are likely to have attracted a financial investment, and for which there is little or no post-project evaluative information. The literature in this review, selected as an overview of the main issues and opportunities that exist currently, hopes to light a definitive path towards a more engaged public.

Amidst reports that there has been a trend in recent years of the public becoming desensitised to Climate Change[1], art is fast becoming recognised as a key medium for communicating

[1] From a report by leading market research company Ipsos-Mori (2011on behalf of BIS (Department for British Innovation and Skills) in 2008-2010.

science knowledge, and it is believed that this method of communication is helping to engage the public in the subject of the environment, sustainability and climate change, globally. However, for art to reach its potential in this way, there needs to be commitment to it, which is likely to call for evidence of its effectiveness in changing human behaviour. The growing interest in the role of art within society in the past couple of decades, has led to the initiation of both community-based arts projects and evaluations (Matarasso, 1996 & 1997; Newman, *et al*, 2003; Merli, 2004; Belfiore, 2006). However, some say that art and science are poles apart and should stay that way (Elkins, 2009). People still assume that art depicts nature, while science analyses it; that art brings things together while science pulls them apart. Both artists and scientists have been engaged in trying to fathom the reality beyond appearances for many years, the world invisible to our eye (Miller, 2014).

Artist Francis Bacon (1909-1992) stated that "*the job of the artist is always to deepen the mystery*" (Jach, 2010). The implication of such a statement is that the remit of the artist is in opposition to that of the scientist, aiming to solve the mysteries, and enlighten the human population. Perhaps what we need is a range of communication routes to suit different audiences and individuals. It is a curious and complex matter and the source of ongoing struggle within the field of public engagement. If it is true that the artist must deepen the mystery, then how can art and science work together effectively? Many people would disagree with Bacon's viewpoint. However, most would agree that the powers of art extend far beyond our current understanding. The end-goal for artists and scientists might be comparable, but the methods for reaching it can be very different. Bacon talks of creativity that falls outside of the classification of art we might have labelled "*illustrative*" or "*expeditionary*", which aims to convey, straightforwardly, the narrative or understanding to the viewer and has nothing to be gained by keeping any element of understanding as a mystery. Scientists have a duty to enlighten us and share their discoveries, and art is often (but not always) relied upon to shed light on a subject and engage the viewer, or at the very least, draw our attention to it. This drawing closer through the stimulation of our curiosity, is what engages us. Just as we might make an unplanned detour to peek through a small hole in a fence, in the unconscious hope of discovery. It is a good argument for the powers of mystery, and holding something back in any case. However, the debate over whether art and science can work together to achieve something new, will be informed by our understanding of its characteristics and potential, some of which are familiar to us, and some are yet to be discovered.

Table 2.1. presents an example analysis of the characteristics of art and science and the potential implications, acknowledging where the limits of our understanding extend, and most importantly what the implications and opportunities might be. These characteristics have been explored further within field research activities in Chapter 4.

Table 2.1. Review of our understanding of art within public engagement.

| **What we know is that…** | **What we do not know is…** | **Therefore…** |
|---|---|---|
| art impacts human brains, to affect health and influence behaviour. We are born with artistic ability. | for what purpose, i.e. what is its biological function? | if it is pre-determined, then we ought to optimise its potential. |
| there are some basic 'rules' that make certain art impactful | how that works and why they are often ignored or denied? | we could be missing a trick within public engagement. |
| art and science complement each other. | If artists and scientists can collaborate towards the same goal. | if collaboration does not influence behaviour, then resources are not being used effectively and there must be a better way. |
| science has knowledge to share. | if people want or need to understand better? | knowledge could influence decision-making. |
| art is evocative. | whether emotions always lead to action? | the impact could be short term and not sustainable and therefore not lead to a change in behaviour, but add to biological stress. On the other hand, it could lead to a monumental shift in behaviour. |
| scientists are answerable to the public and depend on its support. | how this influences the way in which the public receive science knowledge. | resulting behaviour by the public can be consciously self-controlled. |
| artists are not answerable, but can be considered responsible. | the nature and potential of its influence. | the resulting behaviour by its audience is likely to be largely unconscious and unpredictable. |

## 2.2. Promoting Science

Our present education system barely acknowledges inter-disciplinarity, and schools and universities maintain traditional departments such as physics, chemistry, biology, and art. In the post-World War II period, it was recognised that children were being put-off choosing science as a career path, and that this was largely due to the specialized language used in communication within the field. The solution proposed would involve new educational and communication devices (Mead, 1959).

> *"So long as the arts fail to come to grips with the findings of those sciences that are changing the face of the world, there is a danger that the group within which communication is really possible will become narrower and narrower. Thus it is imperative for the arts to come to terms with the physical, biological, and social sciences, so as to preserve and enhance their own powers of communication*." (Mead, 1959; footnote, p.143)

Mead charges art with a duty to gain an understanding of the natural world and apply this to their art practices, for science communication. Since 1959, Mead's vision for a better understanding of science has largely materialised and the language of science has become relatively commonplace. Art's contribution to this is difficult to assess, but it is likely that there are many factors at play, not least the growing supply of information via the media, television and computer technology.

The perspective offered by Thomas and Durant (1987) is that a democratic government requires an informed public for wise decision-making. It is suggested that science needs an informed public for continued financial support. Their argument makes science central to a cultivated mind, just like literature, music and the performing arts does, suggesting that science is the "*distinctively creative activity of the modern mind*". An alternative interpretation could be that science depends upon the connecting-up of information, evidence and ideas for new discovery, so it can explore new territory in search of new possibilities. This is a creative quest for the human brain, one which is not unique to artists.

However, Thomas and Durant (1987) quote American advocate of science, Warren Weaver as an argument for linking art and science. He speaks of the capacity of science progressively to reveal the order and beauty of the universe from the most evanescent elementary particle of the universe itself, why its interpretation to all men is a matter of urgency and significance.

Most relevant are the words "*its interpretation to all men*". Art is perfectly-placed to interpret science and take on the task of communication. One could argue that art is what makes science relevant to humankind. It is reminiscent of Rodin's (1910) claim that art is the exertion of the mind *"trying to understand the world and to make the world understood".* Thomas and Durant (1987) suggest that the "*heart of the matter*" is that ordinary people need to relate to science to "*make discerning judgements about its personal and social relevance*". Ultimately, it is about decision-making.

Does there need to be an interdependent relationship between the two disciplines, and how would this work in practice? Richmond (1984) attempts to illustrate art and science's relationship with his graphs (pp83, 84[2]), but the language that he uses to define relative function and the nature of art and science, could be considered narrow, and a shallow viewpoint of a minority non-artist group. The usefulness of the graphs is very limited, but he states with conviction that the future of art-science communication depends on a decision by artists and scientists to pursue their interests and questions courageously and honestly.

Very little progress has been made towards making science language more accessible to the public, possibly due a to failure to get the message across, public disinterest and inadequately subtle measurement models (Miller 2001). The Bodmer Report published results of a survey by The Committee on the Public Understanding of Science[3] (CoPUS, 1988) which indicated that while 80% of people interviewed declared themselves as interested or very interested in science, only 20% thought that they were well informed in this area. Generally, Miller's (2001) article does not offer anything to this research besides a summary of past events within the field between 1985 and 2000. Its' title *"Public understanding of science at the crossroads"* turns out to be more of a dead-end.

Not everyone supports the idea of art-science collaboration. For example, "*Aesthetics and The Two cultures - Why Art and Science Should Be Allowed To Go Their Separate Ways",* Elkins' (2008) denies a useful connection between art and science, and suggests there is a lack of

[2] Richmond's two tables, designed by Bela Henter, attempt to illustrate graphically where art and science are functionally interdependent and *where* they interact within the logic of two cultures, (which Richmond states is an important and obvious question yet to be answered).

[3] Set up in 1985 by BAAS, the Royal Institution and the Royal Society to interpret science and make it more accessible to non-scientists.

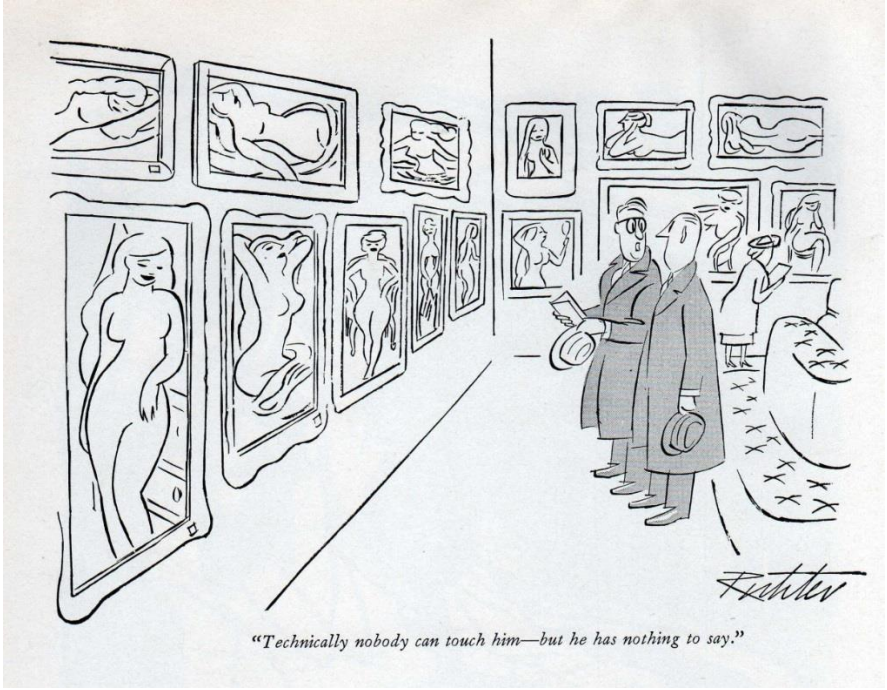
interest by the art world in having one. Be aware - Elkins (2008) is referring to 'Art Historians' and not artists. Just as business bank account managers are not entrepreneurs, art historians are not usually or necessarily artists.

His article raises concerns about the standard of scientists' enquiry in a manner which could be interpreted as condescending, implying that scientists are a threat to the art world. It gives the impression that art historians are not in support of collaboration between scientists and artists. Such an attitude could be interpreted as protectionist, and could indicate a degree of insecurity within the field of art history. Specifically, there is a fear that scientific enquiry threatens to de-value art. Elkins (2008) quotes Ellen Winner (no date) who asks why art historians did not think it important to learn *how* an artist created their work. Elkins' explanation for what seems to be a lack of interest in the neurology, is that art historians speak a different language and exercise a different writing tradition, a literary one, "*without evidence, hypothesis and conclusions*". We are led to believe that this conflict of languages between science and art, and the resulting "*incoherent conversation*", is the frustration and motivation behind the abandonment of his book.

Maybe it is within the contrasting languages of art and science and the new dialogue they make, that there is potential for effective collaboration, which brings meaning and relevance to the public. Could art be the language that is needed for universal communication? Furthermore, and predictably, the establishment art world has given certain "*artsci*" the cold shoulder because of the necessary involvement with technology and resulting reproducibility (Miller, 2014).

Figure 2.1. illustrates in cartoon form how technical artistic brilliance does not necessarily attract approval, nor earn respect by critics within the art-world. An example of this type of prejudice is found with visual artist Jack Vettriano who is not recognised by certain members of the art world because he has no formal art qualifications or letters after his name. And yet one of his paintings sold for £750,000 by Sotheby's in 2004, and he sells a record number of prints.

Fig.2.1. "*Technically nobody can touch him, but he has nothing to say*" The New Yorker 1950-55 Album




However, what an artist might be "*saying*" within a painting could be ambiguous, and the audience's interpretation will be a subjective one. What is the value of art critic beyond raising the questions and hypothesis? Whether the artist makes it clear she has anything "*to say*", in the case of un-challenged artistic brilliance, she must surely have the last say, and the last laugh. Art does not need to be approved by the establishment art world, the education system, or society at large, to influence it. Furthermore, fears surrounding the implications of art-science are more likely originating from non-artist stakeholders.

The future for art-science collaboration will be partly influenced by the commitment demonstrated by the science community, beyond the traditional and widespread use of scientific illustration in taxonomy and biology publications? Art has a role in providing an atmosphere which is conducive to receiving science information. Approximately 50% of respondents at a five-day conference of the Ecological Society of Australia (ESA) in 2003, said that elements of the arts program convinced them that the arts have a role in helping people understand complex scientific information. The study reported a (marginally) favoured usefulness of the arts by ecologists in communicating scientific information to the public,

however, only 24% of respondents said that they would consider using the arts in conjunction with their work in the future (Curtis *et al*., 2012).

The data collected in the survey is far from conclusive. There is a mediocre expression of favour by scientists in response to the ecologically-themed arts events and an equal expression of non-committal response alongside. For example, in response to the question: "*did some elements of the arts program convince you that arts have a role in helping people to understand complex scientific information?*" – 51% said yes, 29.7% said no, 16.3% said unsure and 2.5% gave no response. This could be interpreted as a total of 49% of attendees not saying yes. It does not indicate a consensus. When asked if they would consider using the arts in conjunction with their work in the future, 53.6% of attendees surveyed responded with no and 18.4% were unsure (maybe because they were unlikely to, or could not see how they might do it). Only 23.9% said yes, and were either happy to conform to the idea or genuinely saw potential in incorporating the arts within their work.

Results of the 2003 survey indicate that there is uncertainty when it comes to the potential for the arts to markedly influence the engagement of the public in science matters, and for those delivering the knowledge to be committed to the idea. This study is limited in its usefulness to today's enquiry into the attitude of the science community, towards deploying artistic methods within its communication and public engagement. It does not convince us that the arts can be effective, or even that scientists are committed to the idea. What would be useful to know is how this attitude might have changed in the eleven years that have passed since the ESA event and survey of 2003.

## 2.3. Method, Motive and Measure

It is widely acknowledged that while arts projects have become an important part of community development strategies, they are expected to have measurable, positive impacts on social capital, and funders are now demanding evidence for this. Consequently, evaluations have become a condition of investment (Newman, *et al*., 2003). The task of convincingly quantifying the impact of the arts in terms of social gains is challenging, if not impossible. Evaluations, have proved inconsistent and problematic, largely due to there being no standard methodology for surveying, analysing and interpreting. Even in cases of a relatively structured methodology (e.g. Matarasso 1996) for collecting participant responses, there are flaws in the plan, such as

a lack of causal links and a curious absence of negative feedback. Public investment in arts projects require acts of faith, but maybe one that the public is willing to support. The results of this research confirm public support investment in arts projects, almost equal to science projects (Chapter 6). The impacts of art are difficult to measure and to associate directly with other factors such as environmental conditions, health, happiness and behaviour. However, while arts projects have become an important part of community development strategies, they need to have measurable, positive impacts on social capital, and funders are now demanding evidence for this. Consequently, evaluations have become a condition of investment.

Many attempts have been made to measure the social gains, benefits or output of community arts projects through the years (Matarasso, 1996/97; Newman, *et al*., 2003; Merli, 2004; Belfiore, 2006; Clements, 2007), although it is critical to note that arts projects are not normally designed with evaluation in mind. Evaluation seems to be an after-thought and an unpopular one, at that. Within the arts, one could even go as far as to suggest that the word *"evaluation"* is an unpopular word, (or *"inappropriate within areas of creative processes"*, (Newman, et al., 2003)).

In 2003, Newman *et al.* conducted a review of evaluations to explore the extent to which community-based arts projects have achieved identifiable social gains. Since the mid-1980's, artistic programmes in the UK have developed an emphasis on robust evaluation as a condition of funding. It was found that data were collected via control groups such as volunteers, observers, participants and databases and included the groups' opinions. Opinions are part of the subjective response that is not quantifiable. Matarasso (1996a, p24) suggests that some degree of quantifiable scientific objectivity is considered appropriate and helpful, within evaluation.

Although there have been many community-based arts project evaluations in the past forty years, (Jones, 1988; Matarasso, 1996b; Chell, 1998; Williams, 1997; Kay and Watt, 2000; Lowe, 2000), the sample numbers, depth and objectives have varied. In other words, there is no standard method. In one case, it was reported that "*participation was greatest among the higher social classes".* If so, art-communicated science knowledge could be reaching specific social groups only, and not a wide diversity of population in the general community. This could impact on the effectiveness of sustainable living programmes and the future of art-science collaboration. Although it was hoped that the experiment carried out in this research would attract a diversity of participants in terms of social classes, they were self-selecting within the

public venues (Cardiff and Milford haven). Furthermore, the venues attracted public that were interested in culture, politics (Senedd) and the arts (Torch Theatre). However, Ysgol Preseli and Ysgol Bro Hyddgen provided a captive audience of pupils from a wider diversity of social classes. The online questionnaire research conducted within the Dyfi Biosphere area largely attracted artists and environmentalists with a relatively high standard of education and a focus on quality of life. There was no participation by the farming community. An opportunity remains to conduct further research in the future that is proactive in recruiting participants from a broad diversity of social class.

Apart from having sound methodology within the planning and execution of the evaluation, who is looking closely at the methods employed for analysing and concluding on the data that is collected? For example, what are the implications of having greater participation rates by higher social classes to the validity of such an evaluation, or indeed to the future of community-based arts projects? This trend could be a common trend across all community arts events, in which case, the response to community-based arts projects in developing countries could be very different to the response in developed ones, such as the UK, especially in terms of the social class of participants. Impact value might be easier to quantify.

The outcomes that Newman *et al.'*s (2003) table present are not standardised. This makes the results difficult to assess. Each evaluation has its own set of outcomes, for example the contrasting extracts in Figure 2.2. illustrate the difficulty:

Table 2.2. Simplified extract from evaluation table (Newman et al, 2003)

| JONES, B (1988) | MATARASSO, F (1996b) |
|---|---|
| No details of event given. | Three Gaelic festivals plus others. |
| Sample total - 107 | Sample total – 242 questionnaires; no sample numbers given for other methods. |
| Positive impact on artist<br>Increased capacities for Council<br>Boost for local arts community<br>Community groups worked together, enhanced sense of community and capacity-building | Individual personal development<br>Social cohesion<br>Community empowerment<br>Local image and identity improved<br>Contribution to people's sense of creativity<br>Improvements in Health and well-being<br>Job creation – locally sensitive and sustainable |

What makes this reporting of arts project outcomes problematic in terms of assessing their value is how there is no standard method and no consistency between different evaluators i.e. this example (as in Table 2.2) of Jones contrasted with Matarasso. The first observation to be made is the absence of details (Jones) of the event, however Matarasso's details could be described as sketchy and vague. Sample numbers are provided, although Matarasso's sample number appears to refer to part of the project evaluation only, and not the whole.

Perhaps the only way out of the evaluation dilemma is a "*genuine commitment to serious evaluation work*" (Belfiore, 2006). The question is who has the tenacity for it, and the impartiality for the task? Belfiore (2006) is concerned that aesthetic considerations might be overshadowed by the importance of the beneficial social outcomes, however, one could argue that they are related. A good quality arts project would consequently bring benefits to the public. The difficulty lies in who is qualified to judge quality and how.

Another interesting observation that Belfiore (2006) makes is that assessment of the participants before their involvement in the activity is still rare. Here is a lost opportunity for measurable results. The pre-interaction and post-interaction impact is not quantified. Life-changing effects will realistically take some time to become evident, whereas evaluation usually happens immediately after an event, and often involves ticking boxes. This strategy does not allow for getting to the heart of how art impacts on human behaviour so that its potential can be tapped. It seems likely that funding for this depth of research has not been justified to date.

Public spending on the arts is still significantly lower than in other sectors of the welfare system although arts and culture have gained a much more central role. However, they are often part of a strategy to attract resources as a weak policy attachment. There is a consistent belief in the positive social impacts of the arts and this is evident in the Arts Council of Wales' "*strategy for creativity and the Arts in Wales*" document *"Inspire*", March 2014. There is no specific mention of any ambition to collaborate with science to influence a shift in environmental behaviour.

## 2.4. Factors influencing behaviour change

Fundamental changes in attitudes and behaviours across society are required for environmental sustainability. A growing number of social science scholars are calling for innovative and alternative ways of understanding and instigating social and environmental change and have so far had relatively little to say about what it means to intervene in social life; how to go about effecting, steering or governing change; changing social norms or encouraging people to make better choices. In an era of dramatic environmental change, social change is desperately needed to curb burgeoning consumption (Srengers and Maller, 2015).

The role of emotions in human behaviour has become an increasingly important focus of research within psychology, neuroscience and cognitive design (Damasio, 2006) and has led to the foundation for a new discipline: behavioural economics which combines the study of economic decision-making with psychological work on the nature of human behaviour. It is recognised that beyond the more-than-rational component of human decision-making, there is an irrationality which is not random and can be studied, analysed and predicted. It is in this context that what we term a Behaviour Change Agenda has gradually been emerging in countries throughout the world. While diverse in its forms, the Behaviour Change Agenda utilizes these new understanding of human conduct as a basis for public policy development (Jones, et al. 2013). Recent policies in Wales are developing more emotionally literate interventions such as the use of mindfulness, that account for the influence of emotion and unconscious thoughts on behaviour. However, it is argued that the agenda of behaviour change itself, which is grounded in a particular worldview of individualism, prevents more radical change involving challenges to the status quo, and the emphasis on voluntary measures reflects the general reluctance by governments to regulate individuals and industry (CAT, 2017).

When focussing on stimulants for behaviour change, it is generally accepted that engagement with visual can occur on both cognitive and emotional levels, and that aesthetics play a part in generating a human behavioural response. The role of art in shifting behaviour is being explored in many ways towards behaviour change for sustainability, although art began to engage with environmentalism in the 1980s. There is a belief that art is evocative and has the potential to act as a cultural solution to *"catastrophic climate change*" (Miles, 2014). Another view is that art "*thrives on ambiguities*" and that its enrolment in the mediation of the uncertainties and ambiguities that science generates, is the opportunity (Ruddock, *et al*. 2013). Accepting that art thrives on ambiguity and the spaces in-between language and experience,

some concepts within science that are difficult for the public to grasp and understand could be ideal subjects for art projects, and help people to relate to them. As an example, paintings of various styles, provoke environmental conversations with viewers, regardless of their prior knowledge or the depth of their understanding of the subject. Further-more, it can help them feel positive about themselves and their role within society and the environment. It is the emotional experience that reassures, and justifies their right to become involved. Put another way, "*I feel… therefore I will have my say*". To think without feeling is more likely to lead to a case of chronic procrastination and inaction. One could say if the brain is an engine for action, "*the brain fires with feeling, and tires with thinking*". This also serves as an argument against over-thinking.

Accepting that art-science in collaboration can help convey important messages, there are other factors within society to consider when examining its potential for behaviour change. for example, trust is conducive to the social cooperation that is valuable for prosperity. Trust and social cooperation is dependent upon mutual regard, and threatened by sustained rapid migration, and fast-growing population diversity (Collier, 2013). This suggests that art-science collaboration projects within different geographical areas would vary in effectiveness. For example, the community of the Dyfi Biosphere, which has a population of around 26,000, is predominantly Welsh speaking[4]. The role of language diversity in influencing mutual regard, and the importance of ease of communication, are potential areas for further study. This work draws our attention to the pivotal and potentially epoch-making developments within society and the environment. This study is relevant because the degree of mutual regard within a community could prove to be an important factor influencing behaviour. If mutual regard can be under-mined through fast growing population diversity, then this could have an adverse impact on the effectiveness of art-science communication, across different locations, especially when the desired outcome is a shift in behaviour towards improved sustainability and climate change adaptation.

Additionally, there is believed to be a link between public understanding of science and national prosperity (Bodmer, 1986) proposing that "*no pupil should study only arts, or only science, even after the age of 16".* Succeeding the argument for public understanding of science

[4] https://statswales.gov.wales/Catalogue/Welsh-Language/WelshSpeakers-by-LSOA-2011Census

was public engagement. The Welcome Trust[5] (2009) believe the arts are an effective way of stimulating debate and engaging people with biomedical science. The Trust argues that visual art, music, moving image, creative writing and performance can reach new audiences which may not traditionally be interested in science. Furthermore, it believes that collaborative and interdisciplinary practice across the arts and sciences can help to provide new perspectives on both fields, saying that the arts can also provide imaginative ways of engaging and educating young people in the field of science.

Visual art stimulates debate and helps to initiate conversation among people from diverse classes and cultures. This is easily observed within public exhibition of visual art. Born and Barry's (2009) article mentions how public understanding implied there was a *lacking* among the people and did not acknowledge more culturally-rooted collective public knowledge, whereas the term public engagement responded to a sense of declining trust in scientific institutions. However, on page 110, they highlight an important point, which is that art-science is not portrayed as a field that has any substantial existence, within accounts given by UK funding bodies, comparing it to fields such as biochemistry and nanotechnology. This status leaves art-science at a disadvantage to begin with, but perhaps it is meant to serve a different purpose. There is thought to be a distinction between the provision of public information and the practice of a public experiment, and that public experiments do not so much present existing scientific knowledge to the public, as forge relations between new knowledge, things, locations and persons that did not exist before (Born and Barry, 2009). These relations could be the key to public engagement.

People still think of art and science as being at opposite ends of the spectrum, and assume that art depicts nature while science analyses it. In fact, both artists and scientists have always been engaged in trying to fathom the reality beyond appearances, the world invisible to our eyes. Predictably, the establishment art world has given art-science the cold shoulder, just as it did Renoir, Manet, and the Cubists. Curators and gallery owners tend to treat art works based on science and technology with suspicion (Miller, 2014). In contrast, market research experts Ipsos Mori support the potential value of art-science, in their December 2015 publication

[5] The Wellcome Trust, has been described by the *Financial Times* as the U.K.'s largest provider of non-governmental funding for scientific research.

"*Who's Killing Creativity Now*". They believe that there will never be one single number to tell us the right answer but rather that art must meet science to create something relevant, distinctive and memorable. They explain that they work closely with their clients to ensure that research unites data and creativity. By measuring at the point of people receiving the communications not the point of transmission, helps to understand the true impact and help creativity to have a stronger voice in the boardroom (Beard-Knowland, 2015).

Measuring at the point of receipt and not transmission is perhaps the pertinent point here, but most relevant is the expression of proactive support for collaboration with the creative. The impetus to support art-science projects appears to be coming from a science community and not so much from the art-world, possibly because it has decided science needs art to help bolster support, whereas art does not seek coalition for its following.

## 2.5. Communicating Climate Change

Most people understand the world through stories and images, not lists of numbers, probability statements or technical graphs, and so it is crucial to find ways of translating and interpreting the technical language found in scientific reports into something more engaging. A visual artist can capture the concept of sea-level rise better than any graph, and still be factually accurate if scientific projections are used to inform the work (Corner, 2015). Although in principle this may be so, there are many other factors which can influence the effectiveness of such communication, not least the state of receptiveness and aptitude of the audience. Standards of education, as well as social, economic and political culture are some examples.

From the late 1950's, there was an almost continuous rise in living standards, a slow but steady decline in the working class, major shifts in attitudes towards gender and sexual morality and the emergence of multi-racial and multi-cultural Britain. One might say it brought about the erosion of British national identity (Addison, 2010). These monumental changes to society have altered the ways in which the public receive and interpret information, especially from the government. Growing access to media coverage would have also changed the shape of the rules of leadership and communication. The war posters communication style as an influence on society became redundant as a means for conveying instructions. Chapter 5 reviews examples of these posters and considers their uniqueness and value in a time of crisis.

The insights of Cultural Theory suggest that our world-views and our values exert a strong influence on how we perceive climate change and its attendant dangers. Rather than passively being told by experts what the risks of climate change are, and then believing them, many people project their world-views outwards, thereby shaping the sorts of risks associated with climate change in which they are prepared to believe. Someone who views the world's climate as fragile and easily destabilized, is more likely to believe intimations that we are approaching a tipping point in relation to ice sheets or ocean currents, than is someone who views Nature as benign or tolerant. When scientific assessments clash with deeply held values or outlooks, it may not always be science that triumphs (Hulme, 2013 p.207-8).

With this theory in mind, methods for communicating climate change science knowledge would need to be tailored to accommodate a range of world-views, if they are to be effective. However, the role of art within communication methods is looked upon in various ways. Arts sponsorship was being used *"to draw another veil of acceptability over oil's threat to human rights",* and states that art began to engage with environmentalism in the 1980s (Miles, 2014). One viewpoint regarding the application of art within climate change communication suggests that it thrives on ambiguities and should be enrolled in the mediation of the uncertainties and ambiguities that science generates, saying "*this is the opportunity*" (Ruddock, *et al*., 2013). They describe how art is used in different technological forms to express visually, the physical changes that are taking place in the Dyfi area, especially the River / Estuary Transition Zone (R.E.T.Z.) where water flow and sediments interact in a complex way, a process which is highly sensitive to climate change and human activity. The symposium, "*Future Climate Dialogues*" at Aberystwyth Arts Centre in 2013 was aimed at exploring the potential for collaborative research that might arise from the cross fertilization of arts and science disciplines, in the hope that the dialogue would lead to new avenues for collaboration. A widely-accepted view by those involved in the examination of the subject of art and its role within science communication is, for example, that art can raise awareness through being evocative, use of shock tactics, contemplation, participation and the narrative in engaging people in the topics around environmental science (Miles, 2014).

Recent field research carried out by the author prior to the commencement of this Doctoral study, suggests that the viewing of paintings (especially those of a more representational than abstract style) stimulates environmental discourse, regardless of the viewer's prior knowledge or understanding on the subject. The empirical study confirmed that the public have a

connection with the natural environment, but rarely share and discuss it. Her exhibition of marine environment oil paintings in Milford Haven's Torch Theatre, produced interesting responses. The survey by way of a questionnaire relied upon people to respond without supervision or assistance. Participants were found to have put most effort into answering a question which required them to rate (between 1 and 10) their interest in a list of environment-related topics both *before, and after* viewing the exhibition.

The effort participants made in considering this section was encouraging, demonstrating a willingness to be reflective and requiring a degree of self-awareness. The exercise could have been improved by asking them to rate their interest in the topics upon entering the exhibition, and again after viewing the paintings. In this way, there would be a psychological separation between the before and after, which might have produced a more dramatic shift.

The hypothesis proposed to explain their commitment to answering the question so conscientiously, is that this exhibition gave them an opportunity to engage on an emotional level, with the subject, which made them positive about themselves and their role within society and the environment. It is the emotional experience that reassures, and justifies their right to become involved. Put another way, "*I feel… therefore I will have my say*". To think without feeling is more likely to lead to a case of chronic procrastination and inaction. One could say if the brain is an engine for action, "*the brain fires with feeling, and tires with thinking*". This also serves as an argument against over-thinking. Within climate change communication therefore, the challenge might be one of balancing thinking with feeling.

## 2.6. (Re-)Introducing art to geography

An example of the art of geography can be found with John Constable, who claimed that:

> *"Painting is a science, and should be pursued as an inquiry into the laws of nature. Why, then, may not landscape painting be considered as a branch of natural philosophy, of which pictures are but the experiments?"* (Rees, 1976; p59)

As a naturalistic landscape painter, Constable was influenced by the empirical approach to nature adopted by natural scientists. Realizing that the key to an understanding of natural form lay in a knowledge of structure and process, he became a keen scientific observer. With his

informed interest in the cultural phenomena in the landscape, it is tempting to regard him as a geographer manqué. Being a creative artist, his genius was for regional description, which Carl Sauer called the "*art of geography*." He lived (from 1776 to 1837) in a period of general faith in human intelligence, and of rapid progress in empirical science (Rees, 1976).

Collaborations between geographers and artists have grown exponentially, although there is a perceived risk of collapsing the differences between visual culture as a discipline, and the visual as an accessible mode of research communication (Tolia-Kelly, 2012). One view is that there is a call for a careful and respectful engagement between geographers and visual artists. Tolia-Kelly (2012) highlights a "*neo-visual turn*" that represents a new disciplinary orthodoxy in its drive towards participatory research, impact and engagement and adds that there is a call for the need to be able to differentiate between art and visual culture within cultural geography. The new creative public geographies where the public are no longer passive observers, are redefining through interpretation and adding to the collections. Chapter 4 discusses how the methodology for field research within this project experiments with participatory research, and how the public have contributed through their own artistic creations.

Tolia-Kelly (2012) suggests there is a need to distinguish between art and visual culture, stating that whereas the positioning of art within the discipline has been rooted in art history, it is problematic in both political and philosophical realms. Does art always need to be positioned within art history, to be taken seriously? Perhaps there is a call for a new discipline which is removed from art history and taken on face value, known by a new name, which takes art for public engagement out of the mist and better defines it. Its new name might be "*Applied Art: Art for the survival of civilizations*", or something along those lines.

Within art-geography collaboration, very little is about the geographer practising or *doing* the visual, or indeed the artist taking on the body of work of the geographer. The output is more to do with the relationship between the individuals involved (Tolia-Kelly, 2012). Being a creative association, one could assume there is alchemy necessary for a productive collaboration. In contrast, Hawkins (2013) now sees geographers taking up a range of creative practices, and proposes that geographers need to have a better sense of the artistic terrain if they are to engage with it in any meaningful way, such as towards ontological use. She directs us to the changing roles of artists, perceived as ethnographers, anthropologists and researchers. The list could be lengthy, were other disciplines (besides geography) to contribute, for example, one could add neurologist (Zeki, 1999). It is not clear whether artists work proactively or passively within

such varied roles, or are obliged (even required, in future) to take on these roles. Are they to be volunteers, conscripts or destined to create for the greater good of humankind? Perhaps nothing will (need to) change on this front, and artists will continue to be autonomous and self-ruling, in their creativity.

What is this "*artistic terrain*" of Hawkins' (2013)? She offers examples of creative geographers who register as artistic. The suggestion that geographers need to engage better with it in a more meaningful way could be considered as a high-handed over-reaction to what is perhaps an onus on art to step up to an imperative to convey the impacts of environmental change on the people. The pertinent question under the heading of creative-critical geographies, is how we are going to teach future primary school children, let alone the adult population, about the geography of climate change impacts on their lives and the lives of those around the world. What sort of visual imagery will be considered appropriate and adequate, especially if it is to be *"sensuous and expressive"*? Who will be responsible for the ensuing outcome? It is doubtful we will arrive at an answer to such questions.

Geographers have engaged with a huge variety of art practices including painting, mixed-media art and contemporary participatory works. Hawkins (2011) describe their approaches as dialogues and doings where geographers are acting as curators and collaborators. She sees there is a potential for a contribution to contemporary disciplinary debates through the geographical study of art works. Furthermore, she claims that the study of artworks can contribute to the development of geographical themes and practices, re-visioning core concepts. There are three key themes, the role of landscape, the value of art practices to critical thinking about space and the potential of public art and socially engaging participatory art practices. However, collaborative relations between artists and geographers are, in their current iteration, still very much an emergent field (Hawkins, 2011).

Art in the context of "*Politics in Action*" and Lovejoy's (2009) work is referred to in terms of participatory, community, dialogic and relational aesthetics. The idea of making the audience the site of meaning-making as the primary focus, is comparable with the methodology presented in this thesis in so far as the field research relied upon custom-designed artworks, with the audience in mind, and invited public response for meaning-making. In some cases, this was set up as a public exhibition and in others the site was a school classroom. The critical factor was the audience relationship and dialogue with the art. As for the idea of art being politics in action, results from the art-science field research (presented in this study) indicate

that art can certainly provide a channel for the public voice within a given context, that is climate change impacts. There is a contrast between art produced with this purpose, and art for art's sake, for aesthetic appreciation. The "*dialogic*" moments (Hawkins, 2011) between the researcher-artist (as painting), site and community were evident within the quantitative and qualitative data collected.

It seems that art is being considered useful within geographical research for improving the opportunities for inclusivity and equality. Field research has proved that art as an instrument or apparatus can help tease out societal and political attitudes and beliefs, without having to be direct with questions, where population diversity might inhibit individuals' response.

Whilst acknowledging that there has been a relationship between the arts and geography for hundreds of years, a practice-based relationship has been less present in the past fifty years or more, and has not been examined by geographers for its potential for, and as a form of political critique. However, more recently, the creative, more collaborative work has been undertaken by artists, writers and geographers, plus solo work by geographers as practising artists and writers (Marston, *et al*., 2013) It is suggested that geographers ought to "*develop more of an appreciation of the contributions these expressions make in the world".*

Despite this conviction for the arts, there is also an expression of anxiety over the risks of collaboration and the different methods practiced by each discipline, i.e. geographers disseminate their work mainly within academic environments, whereas artists do so within public spaces. One perspective is that such a collaboration could prove beneficial to geographers where there is ambition for improved public engagement.

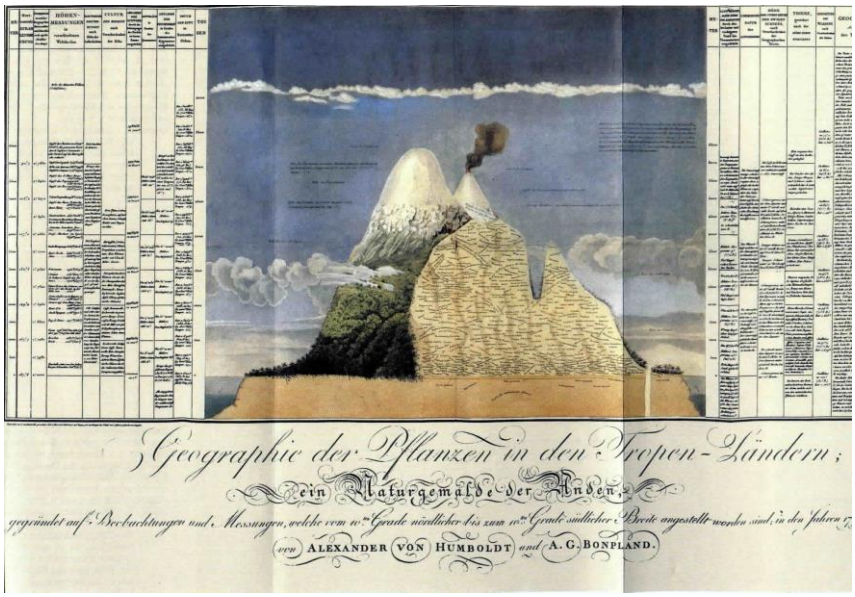
Whilst Marston and De Leeuw, (2013) acknowledge the similarities between them both as being epistemologically and ontologically situated and consumed, they also highlight the rising trend of "*problematization*" and artists as researchers and the growth of creative practice-based doctorates. However, it has been argued within the discipline of design and craft that practice is being used as a means of making tacit knowledge available to research, because it includes the experiential part of knowledge which evades conventional communication by verbal or textual means and which is otherwise neglected by research because of the prioritisation of propositional knowledge (Niedderer 2007a, b).

It could be said that artists are indeed researchers as well as trained observers, ethnographers and interpreters, however, it is difficult to attach a value to artistic output, although the transfer

of information from visual artistic work to viewer (audience) can be virtually instantaneous and competes well with literary or auditory conveyance methods. It might be useful to observe that whilst a creative style of writing is acceptable within human geography, scientists are discouraged from using such literary expression, and trained to get to the point in the most efficient and accurate way possible, using the fewest words. These differences and similarities could stimulate innovative ideas as each discipline contributes to the alchemy of effective collaboration.

However, if geographers are to engage with creative practice, they will need to consider what skill sets are going to be necessary, whilst acknowledging that art is well-established and not new to the world (Marston and De Leeuw, 2013). There is a risk of underestimating the artistic skills required for effective creative collaboration within geographic research, although geographers might find working with tacit knowledge easier than scientists might. On creative geographies, Alexander Humboldt who is often called upon to represent the salient qualities of geographical knowledge and arts practices, argued for the combination of science and the arts in the production of knowledge about our environment. Figure 2.2. is one of the earliest examples of data graphics, and perhaps art-science in practice.

Fig.2.2. Alexander von Humboldt [beginnings of modern data graphics 1800-1849]




As an artist, Humboldt believed that to *"instrumentalise"* art in the service of science was to misread the relationship between artistic practices, broader aesthetic sensibilities, and the

scientific investigation of landscape and environment. He finds in artistic sensibilities not just a desirable source of information, but a form of *"human truth in its own right, in other words, an equal partner to science."* (Hawkins, 2013). Art is after all, the exertion of the mind trying to understand the world, and to make the world understood. Beautiful works of art, which are the highest testimonies of intelligence and of human sincerity, say everything that one can say about man and about the world. They make us understand that there is something else that one cannot know. (Rodin, 1911). Perhaps this highlights the potential for a complementary relationship between art, geography and science. The humblest of viewpoints, that accepts the things it does not understand, is primed for the profoundest discoveries.

There is an anxiety being expressed over collaborations between geographers and artists, the risk of collapsing the differences between visual culture as a discipline, and the visual as an accessible mode of research communication. The view is that there is a need to be able to differentiate between art and visual culture within cultural geography (Tolia-Kelly, 2012). Perhaps there is a fear brewing which relates to not really knowing what art is, whilst visual culture has been easily defined as an academic field of study which includes some combination of cultural studies, art history, critical theory, philosophy, and anthropology, by focusing on aspects of culture that rely on visual images. This concept is prescriptive and more straight-forward.

On the other hand, how do we explain art? We all know that art is not truth. Art is a lie that makes us realize truth, at least the truth that is given us to understand. The artist must know the manner whereby to convince others of the truthfulness of his lies (Picasso, 1881-1973). In other words, art is an imitation of the real things in the world, and a means to make the human realize the truth about the world, which cannot be realized by the human generally (Nova, 2016). Despite this, great works of art help us to understand that there are some things about the world that we cannot know (Rodin, A. 1911).

Over the past two decades, geographers' attentions to the visual arts have broadened considerably and now sees geographers taking up a range of creative practices. Ways in which art and geography intercept include cross-medium analytics and the ontological making and shaping of places and people. Maybe geographers ought to engage in a more meaningful way with art and engage better with the artistic terrain (Hawkins, 2013). This viewpoint could be perceived as an over-reaction to what is perhaps an onus on *art* to step up to an imperative to convey the impacts of environmental change on the people.

A practice-based relationship between geography and art has been less present in the past fifty years, suggesting that they ought to develop more of an appreciation of the contributions these expressions make in the world. One useful observation is that while geographers circulate work (even visual work) textually, in journals or textbooks and tend mostly to speak to other geographers at conferences and in academic settings – practicing artists largely practice and deploy their work with audiences in mind (Marston, *et al*. 2013).

But what sort of visual imagery will be considered appropriate and adequate, especially if it is to be sensuous and expressive, and who will be responsible for the ensuing outcome? Whereas Humboldt (1849) argued for the combination of science and the arts in the production of knowledge about our environment, other more contemporary geographers talk of the crossover of creative practitioners and academic geographers, and the growth of practice-based doctorates as being problematic (Marston, et al. 2013).

One could argue that artists have always been researchers as well as trained observers, ethnographers and interpreters, but cannot be assessed using standards that are applied to other disciplines. It is difficult therefore to attach a value to their output. Ironically, human geography calls for creative writing which contrasts scientific reports where creative expression is discouraged. These differences and similarities could stimulate innovative ideas as each discipline approaches with its own lines of enquiry, equipped with its own customized set of tools, and fuelled by its own appetite. Apart from writing styles, there are examples of creative scientific expression for example in communicating data and concepts through the arts (Tooth *et al*, 2016).

Artists, seen as intermediaries between those who exercise authority and those who do not, (possibly due to the autonomy of art), seek to monitor results and want to know that their art works (Ingram, 2012). Although one could argue that this is a generalization, it is highly likely that artists desire and need feedback, at the least a response from the viewer. After all, no man is an island, and creative practice derived its value from being shared.

On the critical use of imagery within behaviour change, empirical evidence concerning visual material's impact is scarce across the social sciences and yet, they are considered to have the powers of persuasion through emotive impact, and help to bring the audience's messages to the equation. Moreover, vivid visuals leave a rich and strong memory trace. Text-rich education type campaigns have been superseded by visual-rich social marketing. The shift reflects a body

of evidence that information alone does not attract people's attention sufficiently to bring on the changes that campaigns hope to effect. Furthermore, what audiences already know, leads them to selectively highlight, oppose or reconstruct ideas. The increasingly emotive media environment is forcing people to engage, and under certain circumstances disengage (Joffe, 2008).

O'Neill *et al*. (2012) carried out a study of imagery, used in recent years for climate change engagement focusing on newspaper content (presumably photographs) and drawing on the image-sorting Q-method technique. It provides both qualitative and quantitative results.

An example is given of a flood aerial view photograph which consistently ranked highest for importance to people. Common reasoning for highly ranking was that the immediate impact of climate change was obvious, personal and threatening. A comparison could be made here with visual images (perhaps posters and not photographs) produced during World War II, designed to stimulate cooperation among citizens, in the UK and USA, where there was a local and immediate threat from invasion by the enemy – which was also obvious and personal. Examples of these are discussed in Chapter 5.

Further studies of the effect of images on perceptions of climate change have been discussed in Chapter 4.

## 2.7. Collaboration in practice

There are global examples of projects where art-science collaboration has played a unique role in helping communities make decisions (Ingram, 2012). Artists and designers stoke scientists' creativity and although they are becoming increasingly open to artistic collaboration, they feel a need to learn how to avoid professional obstacles such as being perceived as being unfocused or undisciplined. Biomedical scientist Christina Agapakis found a way to meld the two interests – art and science, while earning her PhD at Harvard. Agapakis joined a social experiment called Synthetic Aesthetics, a joint project of the University of Edinburgh, UK, and Stanford University in California, funded by the US National Science Foundation (NSF) and the UK Engineering and Physical Sciences Research Council. Synthetic Aesthetics teamed artists and designers with synthetic biologists and encouraged them to come up with interdisciplinary ideas and projects. Agapakis worked with a scent artist to make cheese — using starter cultures

made of bacteria isolated from the human body. They wanted to make the unseen biological world perceptible to the senses, and to call attention to how synthetic biology might alter microbial communities. She claimed it was the "*creativity of designing, rather than studying biology"* which was most exciting (Gewin, 2013).

Examples of artists engaging in collaborative projects include Aviva Rahmani, helped to transform a former coastal town dump into flourishing wetlands over a period of 10 years (Ghost Nets 1990-2000) in collaboration with the Wells National Estuarine Research Reserve in Maine6. Ghost Nets restored 2.5 acres of habitat in the middle of an Atlantic seabird fly zone, to a flourishing wetlands system and personal residence. Rahmani designed a passive solar home on the site with architect Steve Robinson and created a complex uplands riparian zone garden and water buffer zones. The project was divided into three parts and each part was performative, transformative, and explored another aspect of soil to land and water relationships conceptually and practically. Ingram (2012) explains that Rahmani has grounded her practice equally in art, geographic information systems science and environmental science, and has collaborated with scientists in Colorado pursuing on-the-ground solutions to global warming.

Recently, commitment to the new (art-sci) hybrid, which is considered by some institutions as enhancing creativity and innovation, is demonstrated via the creation of cross-disciplinary centres. Also, funders are fostering academic efforts to create art-science collaborations and the Wellcome Trust's arts budget has grown from £100,000 to £1.4 million within the past 16 years. For some scientists, the focus has shifted from looking at simple environments, to complex ones. It looks like becoming a two-way partnership, where scientists are being proactive and tapping into grants, students and conferences that they would not have otherwise, although there are some research institutions that actively discourage them because of the difficulties of evaluating and measuring their output. Artists act as intermediaries between those who have power and those who do not, and this is possibly due to the autonomy of art in the modern period, allowing critical distance, independence and interaction with diverse groups (Gewin, 2013).

[6] http://avivarahmani.com/essays Aviva's comments on her experience of collaboration.

The idea of working with artists was explored in 2012 between stem cell researcher Professor Sara Rankin and Gina Czarnicki as a way of engaging the public (Wellcome Trust, 2013). In summary, Rankin says that successful collaboration begins with being clear about your goals and sharing the same basic outlook and values. Excellence (in both disciplines) is rated as a critical factor too, and ensuring that the art is not merely illustrative but encourages multiple interpretations. As with all projects of public engagement, the difficulty is in reaching a wide audience. Therefore, regardless of the potential impact of the collaborative product, it needs to be exhibited in accessible public venues. This offers the opportunity for the public to experience the research (scientific in this case), have an opinion on it and discuss it in conversation.

The Wellcome Trust (2013) supports collaborators to make the most of their opportunity by suggesting some rules of thumb. This seems like a good idea and one that has likely evolved out of problematic relationships between collaborators in the past. It pre-empts potential pitfalls such as unclear aims at the start, misguided expectations, poor communications and misunderstandings in general, which can arise between professionals used to working in contrasting ways. There is a counselling quality to the Wellcome Trust's approach in encouraging successful collaboration between artists and scientists. It has the potential to diffuse any initial contention between collaborators prior to commencement. It is a reminder of the need to tolerate our differences, and have faith in a productive outcome, even if the journey is a little bumpy, believing that the gain is going to be worth any pain.

In the case of the Welcome Trust's *"Arts - using film to explore neuroscience"* scientists find themselves intrigued by artists' approaches, and they state that in working with them, it has been possible to engage the public in ways not possible by conventional discussion of the science, i.e. "explore" rather than "explain".

Similarly, the Cape Farewell project was created in 2001 *"to evolve and amplify a creative language, communicating on an emotional level and on a human scale the urgency of the global climate challenge."* The project's three principle objectives are to explore the science of climate change; to create and share a body of artistic responses to it; and to engage a public audience in understanding and responding to the climate change challenge. Being artist-led, the arts are a core part of the Cape Farewell project. Working from their offices in the UK, their small core teams work at the centre of an international programme of activity where artists and creatives are invited to join the expeditions, exploring arctic science, sustainable island

communities, urban regeneration and the Cleantech industries. The project offers a route for artist development, towards the creation of a raft of original artworks, films, music, books and poetry. Partnership with world-renowned organisations brings opportunity for showcasing and bringing the creative work to the wider public. The belief is that one salient image, a novel or song can speak louder than volumes of scientific data and engage the public's imagination in an immediate way.

Another example of collaboration within art-science is Leonardo/ISAST[7], a global network of distinguished scholars, artists, scientists, researchers and thinkers. Their programmes focus on interdisciplinary work, creative output and innovation, through publications, initiatives and public forums, workshops, connecting the community, educators and students, through art/science/technology. Leonardo supports experimental projects and interacts with established institutions of art and science to transform their research and educational practices. Their scholarly books and journals are published by The MIT Press and include Leonardo, Leonardo Music Journal, Leonardo Electronic Almanac and the Leonardo Book Series), as well as ARTECA, their latest joint digital publishing project with The MIT Press.

The organisation seeks to

> *"catalyze fruitful solutions for the challenges of the 21st century. Among the challenges requiring cross- disciplinary approaches are establishing sustainable environmental practices, spreading global scientific and artistic literacy, creating technological equity, and encouraging freedom of thought and imagination".* LEONARDO (2017).
>
> Online at: https://www.leonardo.info/mission

In partnership with the North Devon Biosphere Reserve, Appledore Arts ran *"Sea 4 Life"*, a highly successful joint initiative with 120 pupils from four local schools. Through a cross curricula approach, they learnt about their coastal habitats using biology, geography, art and outdoors learning[8]. Cornwall's "*Land Matters*" research-based arts collective is interested in a wide range of work including processes of landscape change, deep time and ecology, and is described in a specialised, conceptual way which would be problematic to a public audience and would certainly exclude a sizeable proportion of them (Land matters, 2013).

[7] Leonardo/The International Society for the Arts, Sciences and Technology

[8] http://www.appledorearts.org/projects.htm

Within Wales' UNESCO Dyfi Biosphere, the arts network remains largely inactive and unrecognised within the community, despite attempts to establish aims and objectives several years ago. There is no shortage of artistic talent and enthusiasm within the community, but a lack of funding means there is no-one to lead, motivate and co-ordinate. However, *Cymerau* (Confluence), is a mid-Wales arts and humanities study for the AHRC-funded project Hydrocitizenship. It asks, "*What does water mean to us, as communities and individuals?*", and it commissioned artists to work with communities, between September 2015 and August 2016. They created *"Map Dŵr",* (a digital water map) to reflect local stories that emerge, whilst improving communication between people with conflicting interests, policy makers and the communities that they serve.

We are informed by Welsh government funded report Emergence[9] (Volcano, 2014) that artists are fundamentally questioning or changing their creative practices in response to an imperative for sustainability The report was hoped to contribute towards future arts policy within the context of the Welsh Government's "*Well-being of Future Generations' Bill*" tracked the extent and variety of the emerging projects known within the report as 'initiators' who are leading the way. There is significant evidence that the arts have a crucial role in – and a responsibility to - the current culture-shift taking place in Britain. Artists do something that no other discipline can achieve. Through the arts, they can create space for dialogue, they can help to communicate complex ideas, they can support people in imagining a positive future. The arts give people permission to be confused and uncertain as well as to give voice to new and emergent solutions. There are many artists taking on this challenge, although there has been a UK government level policy gap emerging where the arts are being left as bystanders while sustainable policies get drawn up (Allen, *et al*., 2014). However, since April 2015 Wales leads the way with The Well-being of Future Generations (Wales) Act 2015. This Act is about improving the social, economic, environmental and cultural well-being of Wales by means of a more joined-up approach.

The Act will make the public bodies listed in the Act think more about the long term, work better with people and communities and each other. This is part of an objective to make sure that decisions made by public bodies are sustainable. The Guide to the Wellbeing of Future

[9] *"Emergence: Culture Shift*" is a report produced in Wales in 2014 by Volcano as a collaborative project.

Generations Act (2016), states that involving the public is one of the ways in which the Welsh government intend to achieve this. The arts are potentially an effective channel for public involvement.

A recent example of art-geography practice was screened at the RGS Annual Conference[11] in Exeter 2015. The film titled "THEY" (Critchley, 2015), is about the Somerset levels floods of 2013-14. Critchley describes the post-flood scene as one in which "*many were left feeling isolated and caught in an otherworldly displaced space, where time stood still.*" The film, a fifteen-minute continuous loop with sound, responds to stories collated from those affected, reflecting on the accounts given of their forced adaptation. Also on view at the RGS Annual Conference 2015, and based on the same weather events, was David Mansell-Moullin's (2015) solo exhibition *"Submerged - Portraits from the Levels"*. His series or portraits presents the human experience of flooding one year after the Somerset (UK) winter storms of 2013-14. The exhibition portrays those directly affected by the floods, along-side those involved with flood management and emergency response.

The symposium in January 2016 at Aberystwyth Arts Centre, "*STRATA: art and science collaborations in the Anthropocene*" brought together practitioners who work collaboratively across the arts and sciences (both broadly defined) in addressing the concept of the Anthropocene. The symposium's principal remit was to consider the ways in which art and science collaborations are responding to the Anthropocene debate by representing the past, present and future impacts of human activity on the Earth system (Critchley, 2015). The event was a collaboration between Aberystwyth University School of Art and the Department of Geography and Earth Sciences, and supported by the British Society for Geomorphology. Strata brings together practitioners who work collaboratively across the arts and sciences (both broadly defined) in addressing the concept of the Anthropocene. The symposium's principal remit was to consider the ways in which art and science collaborations are responding to the Anthropocene debate by representing the past, present and future impacts of human activity on the Earth system.

The symposium was concurrent with the exhibition Stranded by Heather Ackroyd and Dan Harvey at the Arts Centre, and is a collaboration between the School of Art (SoA) and the

[11] Royal Geographic Society Annual Conference – 2015 conference theme Geographies of the Anthropocene

Department of Geography and Earth Sciences (DGES), organised by Julian Ruddock (SoA) and Stephen Tooth (DGES). However, where contemporary art projects like these are highly-conceptual, some viewers are alienated and can struggle to relate to and therefore appreciate them. Viewers could in some instances be funding decision-makers, or closely associated. Where artwork is very abstract, it will generate mixed feedback (if any). If the audience struggles to understand or relate to it, there is likely to be no further discourse. Voicing critical comments would be risky for the average individual, who prefers not to stand out from the crowd (The Emperor's Clothes phenomenon). The exception to this would be where the audience is selected (or self-selected) being already engaged with the artist's work, and possessing the confidence through a relatively high level of intellect and intelligence to relate to the work.

A further consideration is the question of audience size in terms of how much exposure is enough to justify the investment. The reality is that in many cases attendance is very low and the event consumed by the few, as opposed to the mass, which brings into question the quality of the project objectives and management. Recent conceptual arts projects include live and interdisciplinary art practices by an itinerant collective of artists known as Ointment, based in West Wales. Artists and participants in this project enjoyed the process and experience. They took away a souvenir in the form of herbal ointment, but for the not-so-intellectual non-arts-orientated public, this type of project is difficult to relate to within the context of art. Perhaps if it had been framed as a nature film or science programme, it would have been easier to consume and appreciate. The artists and self-selecting participants may have been the main beneficiaries of this project, and perhaps the collective's ambitions were realized.

Another project set up in recent years appears to attract mainly arts-based participants such as visual artists, poets, writers and performers. Hydrocitizenship and its Welsh project, *Cymerau* (Confluence, in English) state that "*artists are carefully selected and funded to provide unique and interesting ways to relate to water…it's an opportunity for residents of the Dyfi Biosphere to think about what it means to be an ecological citizen*." It might be prudent to ask who the target audience is, and what proportion understands the concept of being an "*ecological citizen*". Most public relate to water in terms having a supply of clean water for drinking and washing, protection from too much water (in other words, flooding), and for recreational purposes. However, this project is an arts project and should not be confused with a social

science one. This type of project tends to attract the arts and environmentally orientated public, in the main, however perhaps that is the aim.

One theory is that if an arts project is difficult to explain to your next door neighbour, work colleague, or even a member of the family, and you find that their blank expression remains despite your efforts, you can be certain that you are talking about a high-concept idea, that most public believe has nothing to do with them. Additionally, because these projects require a relatively developed intellectual capacity for engagement and participation, they therefore make a daunting prospect for any challenger. There is a place for high-concept arts projects, of course, but maybe we ought to be more discerning when it comes to committing funding and support for arts projects which are proposed for the benefit of a community resilience. There is also a need to consider the opportunity-cost of favouring one project over another. Furthermore, if projects that *do* engage most of the public, have (historically) been thin on the ground, then now is perhaps a good time to explore their potential. Other examples of art-science type projects are "*For the Birds*" (2014), climate change work by Gormley (2015) and the Greenmuseum – a USA volunteer-run organisation that describes itself as a "*giant collaborative art-making tool*".

A more accessible example of art-science in practice is included in the article "*Science and Art: Artists to Africa*" (BTO, 2014). By bringing artists and scientists together they have been able to look at some of the issues faced by summer migrants on the wintering grounds from different perspectives. The artists have engaged with the landscapes and summer migrant birds from a different starting point and provided a different perspective for scientists, which also helped in delivering it to a wider audience. Similar collaborations are practised within other environmental non-government organisations such as the RSPB and the Marine Conservation Society (MCS). The author, herself, was involved in two art-science collaborations with the RSPB. The first was a commissioned body of paintings to celebrate the RSPB Cymru's 20th anniversary[12] of owning and managing Ramsey Island. The exhibition of work was launched at Pembrokeshire National Park's gallery and visitor centre – "*Oriel Y Parc*" in St David's in 2012, followed by a public exhibition at the Senedd, National Assembly for Wales in Cardiff. Her subsequent collaboration was with the RSPB to support the "*Future of the Marine Atlantic Environment*" (F.A.M.E) bird tracking project in 2012. Exhibitions (of Field's paintings of

[12] Link to article: https://www.rspb.org.uk/our-work/rspb-news/news/317460-rspb-cymru-celebrates-20-years-on-ramsey-island-scroll-down-for-welsh-language-version.

Auks diving off Colonsay Island, together with other artists' work) took place in Orkney, Glasgow and Cardiff. The collaboration was aimed at supporting the publishing of the bird tracking data, and engaging the public. The paintings can be viewed on her website gallery pages at www.rhianfield-art.co.uk. The first example in Figure 2.3. below (left), was created for RSPB Cymrus's Ramsey Island commission and the second (right), for RSPB's F.A.M.E. project.

Fig.2.3. "*Belonging at Ramsey Island*" 20" x 20"(left), and "*So Near, So Far*" Guillemots 40" x 30" (right), Medium: oil on linen, Rhian Field (2012)

There is no reference to the arts in the context of climate change and public engagement, within the Arts Council Of Wales Remit Letter 2015/16, although reference is made to sustainability. In contrast, the IFACC[13] report: *The arts and environmental sustainability: an international overview*, suggests that good leadership in the arts means recognising and driving new ideas that connect the arts to wider communities, economies, and values, and finally that the social contract – the do-no-harm contract that receiving public funding implies – is the foundation upon which artistic investment, community development, skills, tourism and audience development rest. It recognises that in all spheres of life and art it is time to acknowledge the intimate connectivity of humans to one another, and to the ecosystem as a whole. The challenge for the arts now is to recognize that sector leadership, in the absence of robust political, regulatory or financial interventions, is critical, and that this is not an issue that can be left to others (Moore and Tickell, 2014).

[13] International Federation of Arts Councils and Culture Agencies

The IFACC report states that within the Arts Council England, Creative Scotland and Arts Council of Wales Environmental sustainability is part of strategic planning and action for the arts councils in England, Scotland and Wales. This commitment to environmental sustainability is the result of sectoral leadership from a critical mass of organisations working in partnership with these arts councils, champions within these bodies and helpful legislative prompts.

Some artists are more interested in the freedom to solve the special problem, style or technique which fascinates them. Others seek freedom to use style and technique to express their views about society and political processes. Those in the latter group are sometimes inclined to speak about artistic responsibility. For them, art does not exist merely to entertain and gratify the senses; it must edify. It must play a role in the improvement of our collective existence. So long as there are political wrongs to be righted and unjust or ugly social conditions requiring change, art must participate through visual education and persuasion in the development of popular attitudes which can lead eventually to a better society (Feldman, 1972).

The Guerrilla Art Action Group (1970) in its manifesto raised a fundamental concern on artists' role in political processes; be it law-making or representative selections. The Group declared, that art is becoming a meaningless game for the sole benefit of those engaged in the suppression of human life and values. Their manifesto questions art's purpose, and challenge whether it is a game of repression and destruction or an educational process of awareness that helps gives relevance to life. The non-profit online museum of environmental art, Greenmuseum (launched in 2001 but no longer active), believed that art helps improve our relationship with the natural world, in the way that it informs, interprets and helps us re-envision our relationship with nature.

A unique form of collaborative art comes in the form of cartoons, often placed within an environmental context. They can play a critical role in climate change communication by providing a commentary on the relations of power and knowledge, within which climate change communications and debates are located (Manzo, 2012). In other words, cartoons present the geopolitics of climate change, although the critical message of a cartoon is interpreted via different social channels. For example, a wide audience might appreciate and gain entertainment (and perhaps important meaning) not only from the cartoon, but from a variety of points of view, perhaps politically, environmentally, ontologically, ideologically, or

from some other personal connection made emotionally and psychologically. Therefore, a cartoonist artist has both challenge and opportunity when designing a cartoon.

One method used for creating impact within cartoons is caricature or exaggeration (Rodin, 1911; Ramachandran and Hirstein, 1999). Manzo claims there is a call for further research into audience reception of cartoons, especially studies into how images are consumed and how climate change cartoons are interpreted, whilst contributing to projects in political geography. It seems that now is a good time to better-understand how *all* art is received, if not understood, and how individuals interpret them to make sense of their changing environment, and their place within it. Examples of cartoons are included in Chapters 4 and 5.

There has been very little empirical evidence across the social sciences regarding the impact of visual material on the public's engagement with a message, although there has been a growing interest in recent years. No attention has been paid to different responses within viewer groups even though charities have found that there are preferential responses to certain types of promotional images between socio-economic groups. Therefore, when it comes to the design or selection of an image, it is not only the qualities, emotional tone and content which counts, but also positioning and identification of the viewer (Joffe, 2008).

The persuasive influence of Photography is debated, specifically its ability to capture complexity, invisibility and change, especially at a single moment in time. Despite its questionable limitations, photography ought to be included as a collaborator within climate change communication (Maibach and Priest, (2009) in Manzo, 2010). After all, there is probably a photographic image in every person's mind that has made an indelible impact and is easily recalled, perhaps the one of the "*Napalm Girl*" by Nick Ut (1972), or refugee children drowned and washed up on the shores of Greece (2015). Impactful photos are recycled, re-distributed and shared with other people within the spaces of social media all day and every day. They appear, they make their impact, they fade and are gone, replaced by another, and another.

## 2.8. All those in favour please stand up

Before we can begin to make an informed judgement on the value of art-science collaboration, perhaps it would be useful to consider what characteristics it presents. Table 2.3. offers a traditionally business-like approach to assessing the potential for successful art-science collaboration. For this academically unconventional analysis to be fully useful, one would look

to build on the strengths, manage the weaknesses, exploit the opportunities and mitigate the threats. At the very least, it provides a starting point for development and might contribute something to evaluation of projects.

Table 2.3. Boundaries, Limitations and Scope. S.W.O.T. Analysis for Art-Science Collaboration.

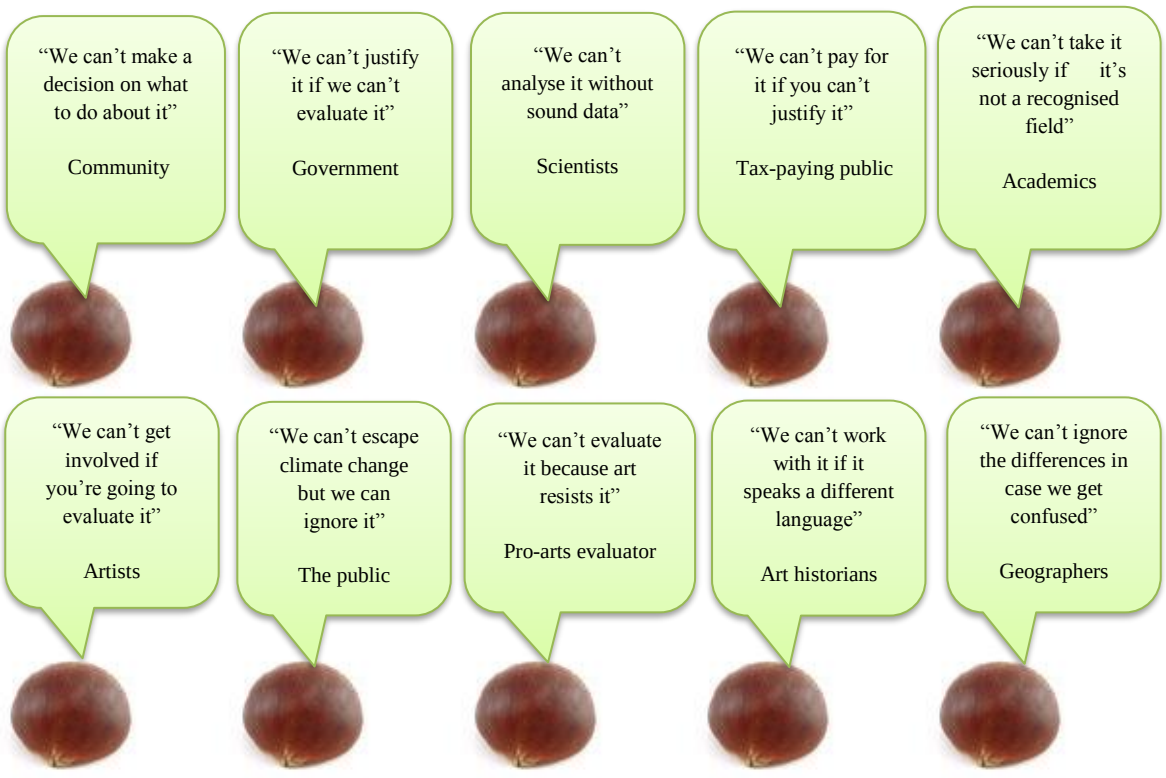
| | **Details** | **Implications** |
|---|---|---|
| Strengths | Bigger skills pot. It is a relatively new idea. It is growing in popularity. Digital technology marries well with visual output and communication.<br>Art is a universal language. | More versatile, bigger potential and scope. Largely unexplored. People are familiar with the idea and this method of communication. It is easy to share/repeat locally and globally. |
| Weaknesses | Quality too varied – no standards set.<br>The value of art is relative.<br>Two different ways of thinking/disciplines, sometimes conflicting; different motivations.<br>Art is subjective and mysterious, while science is objective, enlightening.<br>Artists' autonomous position could compromise leadership efforts. | Difficult to control and monitor, therefore funding can be hard to source. There can be conflict and disagreement over aims and goals. Not to everyone's taste; often hard for the ordinary person on the street to access and relate to. Funding could be committed to alternative projects. |
| Opportunities | To take advantage of relatively un-tapped resources and ideas.<br>To influence government policy.<br>To influence human behaviour in the environment.<br>To develop a new field of study, combining disciplines.<br>Possibility of new discoveries (innovation). | Could develop new ideas within cultural politics; lead to new discoveries in science; contribute to new thinking and behaviour in climate change adaptation and impact mitigation (survival of humankind). Could lead to new paths of research and the development of new skills in art and science. |
| Threats | Reluctance by the art world to be evaluated.<br>Lack of quality-control management.<br>Lack of interest, lack of investment, poor engagement by public.<br>Lack of commitment by scientists to the idea.<br>Stakeholders with different agendas.<br>Opportunity cost.<br>Difficulties of evaluation – no evidence.<br>Lack of robust evaluation techniques and methodology.<br>Fear | Could be perceived as insecurity or protectionism. Elitist nature of the art-world might stunt progress. The public are consumers and can be fickle - unpredictable conditions, therefore difficult to plan.<br>If scientists are not 'on-board' there will be no progress. Varying agendas can muddy aims and objectives. Funding would need to be used for other worthy cause. Without meaningful evaluations, there can only be half-hearted support. |

We can summarise from Table 2.3. that in principle, the apparent complexities of art-science collaboration limit its progress. One could say that the conflicting interests of stakeholders merely bring chronic delays. In light of this analysis in Table 2.3. there is a call for pragmatic leadership of art-science within a context of climate change adaptation, which strives to configure the actant elements to encourage forward movement. An interdisciplinary approach

could help us to identify art's "*own powers of communication*" Mead (1959). The progress that has been made within society in realising this vision in the past fifty years can be largely attributed to Mead's (1959) ambition and conviction. Television documentaries, powerful visual marketing, digital data transfer and internet technology has made a lasting impression on the public with visual imagery in the past thirty years or so.

Computer technology has changed the shape of teaching in schools and colleges as well as generating new categories of jobs and occupations, together with leisure activities. It seems that the world now engages with science on its doorstep, daily. However, even as recently as 1987, Thomas and Durant were drawing on references from the 1960s and 70s and asking the question "*why bother to communicate science*"? It still needs to be asked today. The answer is dependent upon who needs to know. People had better know something about science if science is to be controlled by the people (Thomas and Durant 1987). Science needs to be supported to be financed, and the public need to be informed to make sound decisions. Figure 2.4. illustrates the many different perspectives within the debate, and each can contribute towards procrastination and low levels of relative conviction for the field.

Fig.2.4. "That Old Chestnut" Field (2014)



The idea that science is the "*distinctively creative activity of the modern mind*" (Thomas and Durant, 1987, p.7) is not ridiculous. Science depends upon the connecting-up of information, evidence and ideas for new discovery, to explore new territory and in search of new possibilities. This is a creative quest for the human brain, one which is not unique to artists.

But, why are we still asking what makes science so important and its interpretation to all men so vital? (Warren Weaver 1966). On employing new communication devices, one could argue that art is what makes science relevant to human existence. Perhaps it is the catalyst that is needed. Another argument suggests that there are moral benefits to be gained from an understanding of science, and that enlightenment in science makes people wiser and indeed *better*. Despite this idea being shot down in flames so to speak since it has been perceived to introduce unpopular products (such as the international arms race), the benefits to humankind that have developed through scientific exploration within the same period ought not to be taken for granted. People cannot pick and choose scientific breakthroughs. Human behaviour cannot be grown in laboratories…yet.

Leading environmental scientist and first advisor to a US president on climate change, Gus Speth, has reframed the top environmental problems as selfishness, greed and apathy and goes on to say that to deal with these we need a spiritual and cultural transformation and (maybe most importantly) "*we scientists don't know how to do that*". People Unite are part of a growing movement of organisations, individuals, activists and campaigners who are working together to strengthen ideas of compassion, neighbourliness, social justice and concern for others. They believe that the arts have a vital role in promoting kindness as a radical idea that could help create a more sustainable and humane world (Neal, 2015). This could be viewed as idealistic and maybe even unrealistic by some.

An earlier and more formulaic idea of art's role focuses on interaction and interdependence but using narrow language to define relative functions and the nature of science and art (Richmond, 1984). His table of functions which attempts to illustrate where art and science are functionally interdependent is difficult to apply. It could be said that Richmond's viewpoint is shallow and looks at a minority, not the big picture, (and certainly not from an artist's perspective it seems). Similarly, Miller's (2001) article leaves us with little to take forward as it seems to only confirm that little has been achieved since The Bodmer Report of 1988, which highlight the need for an overall awareness of the "*nature of science*" and, the way that science and technology pervade modern life. The report's aim was to generate debate and decisions on how best they can be

fostered, making several recommendations, addressed to the scientific community itself, including the Royal Society as well as to the education system, the mass media, industry, government and museums. Bodmer discusses the "*failure*" by the scientific community to get the message across, a "*lack of interest by the public*" and measurement models that are not subtle enough. All three most likely apply, although besides this, he does not offer anything to this research besides a summary of past events.

A promising title and an empty threat, is what Elkins' (2008) offers with his article "*Aesthetics and The Two cultures - Why Art and Science Should Be Allowed To Go Their Separate Ways".* It refers to art, artists and artworks under the umbrella of art history. His concern is that scientific focus on certain artists could de-value art, claiming that art historians speak a different language and exercise a different writing tradition, a literary one, "*without evidence, hypothesis and conclusions*". Art history must surely rely upon the evidence and clues that surrounds an artist's lifetime, such as family and relationships, lifestyle and events, the social and political environment of the time, etc. His argument is difficult for an artist-scientist to sympathise with.

The commitment of scientists, as well as artists, is essential to the success of any collaboration. It is presumably a pre-curser to any project proposal, but how is this determined? Whilst there is acknowledgement of art's role in providing an atmosphere conducive to receiving information, and its usefulness favoured by ecologists, there is evidence of relative indifference (Curtis, *et al*, 2012).

Figure 2.5. illustrates the separate, and indeed opposite paths for art, and for science, of previous times. It was necessary for the public to choose one direction or the other. Metaphorically, they lived in different lands, with different cultures, spoke different languages, were motivated by different aims, and were subject to different politics, leadership and constraints, etc. Blurring the boundaries might not be such a bad idea, as it would likely lead to a sharing of intelligence and resources, and in the spirit of this cartoon illustration, it would save on travelling.

Fig.2.5. *"What went wrong?"* Rhian Field 2016


The approach adopted for interpreting data we assume is often (if not consistently) dependent upon the interests of stakeholders. Within Curtis, *et al.*'s (2012) study for example, a marginal majority of 51% supporting art's role in communicating ecology is weighted against a 49% of attendees not saying yes. This represents a less than satisfactory result for stakeholders of art-science projects, even though there was no clear rejection of such collaboration. The result could be interpreted as either non-committal or promising; an indecisive result, but certainly not nugatory. Additionally, with less than a quarter of attendees (23.9%) expressing an interest or willingness to consider using the arts in conjunction with their work in the future, it looks as though the jury is still out, when it comes to the potential for the arts to markedly influence the engagement of the public in science matters. It seems reasonable to suggest that those delivering the knowledge would need to be committed to art-science if there is to be an effective collaboration.

Art-science collaboration in the form of community-based art projects has the potential to bring people together in an environment, to act as an example to other communities, e.g. in matters that relate to sustainable living and climate change adaptation. In an ideal world, people would put their differences aside and come together as one force, to work with nature, using good

over evil, reason over reaction, cooperation over coercion, and so on. In fact, it could be as simple as realising that we're all on the same side, all facing the same threat, and we need each other's skills.

Paul Collier (2013) warns of the threat to mutual regard (not respect) of growing diversity, which leads to a loss of trust and social co-operation. Growing diversity (brought about by sustained, rapid migration), could affect the way that a community might engage in community-based art projects and environmental matters, such as climate change adaptation, although the impact of such changes in population diversity would be more prevalent in large cities. He explains that there is a moral code of honour - "*trust is conducive to the social cooperation that is valuable for prosperity*", and draws our attention to a pivotal and potentially epoch-making development within society and the environment. It has been included in this review as a reminder of how the behaviour of a community might be affected by rapid growth in diversity of its population, and mutual regard, trust and cooperation be undermined. To what degree does mutual regard influence public decision-making? These aspects of human behaviour could have a significant bearing upon the value and success of art-science collaborations in engaging the world.

If we consider art-science as a new phenomenon with aspirations to change the course of human events, it's potential is almost un-measured and unknown. Some see it as going beyond being a way of assembling a public for science, and more of a public experiment (Born & Barry, 2010). More than twenty years ago, scientists saw themselves as under attack, when it was proposed that "*no pupil should study only arts, or only science, even after the age of 16"* (The Bodmer Report, 1986). The report came in when economic growth was dependent on all factions of the public having *some* understanding of science, in other words, there was a link between public understanding of science and national prosperity

There is little doubt that visual art stimulates debate and helps to initiate conversation among people from diverse classes and cultures. This is evident within public exhibition spaces of visual art. Funding bodies became committed to the idea that art-science would "*assist by assembling a public that was not only ready to participate in debate about the risks raised by scientific research, but excited and entranced by science".* However, UK funding bodies do not acknowledge art-science as a field per se, when compared with fields such as biochemistry and nanotechnology. The idea is that public experiment (beyond public engagement), can forge relations between new knowledge, things, locations and persons that did not exist before (Born

& Barry, 2010, p.110). Perhaps art-science's symbiotic relationship needs to develop so that it can gain recognition as a field.

## 2.9. Summary

This review focused on literature relating to art and collaboration with science and geography. The growing interest in collaboration has led to new interdisciplinary trends towards familiarisation with the arts and the adoption of more creative methods of research and communication. However, reading between the lines, the anxiety sensed within non-arts disciplines in relation to collaboration, could stem from a fear of wandering into unfamiliar territory, one that is uniquely autonomous and largely mysterious.

It appears there are widespread gaps within the landscape of art, science and geography collaboration and therefore hold potential for development and new horizons. Whilst acknowledging fears over differences, lack of commitment, the growing communication challenges of Britain's peace times, threats to communities due to rapid growth in population diversity and the risks of blurring boundaries or collapsing them, there is also the awareness of untapped potential and scope for breakthroughs.

Science has shifted in bounds in the past 60 years, from being esoteric to everyman's, as television, information technology and social media bring it to the public's supper tray. There is scope for developing more robust and credible methods for monitoring and evaluating public arts projects, and for realising art's value to humankind.

"*That old chestnut*" debate reminds us of the eschewing and procrastination that maintains the status quo of inaction. If we embrace the idea that geography tells us where we are, science tells us what we are and art tells us who we are, the establishment of a new field which brings them together might prove extremely productive within climate change adaptation. However, art-science is handled, or managed, it needs to be accessible and in the public domain. If science lacks the ability to transform spiritually and culturally then art can potentially fill that gap, through collaboration.

# CHAPTER 3: Art and Human Behaviour

## 3.1. Introduction

Seeing comes before words. The child looks and recognizes before it can speak. But there is another sense in which seeing comes before words. It is seeing which establishes our place in the surrounding world; (Berger, 2008).

Fiction (via the arts) has given us the ability to go beyond saying "*Careful! A lion!*" as many animals and human species had been able to say previously, and acquire the ability to say, "*The lion is the guardian spirit of our tribe*". This is a most unique feature of Sapiens language and appeared with the Cognitive Revolution. Such myths give Sapiens the unprecedented ability to cooperate flexibly in large numbers. The Cognitive Revolution enabled the transmission of larger quantities of information about the surrounding world and the social relationships of Sapiens, as well as things that do not exist (Harari, 2014). The unique ability to make artistic representations (such as cave paintings, figurines and jewellery etc.) would have been critical to the initial momentum of the revolution and to the products of social relationships ever since.

Hunter gatherers made these handprints in Figure 3.1. about 9,000 years ago, in the Hands Cave in Argentina. Nobody knows what it means, but it is captivating and stirs our imagination. It resonates with us and we relate to it, despite the time that has passed, and the contrast in lifestyles. There is something both startling and comforting about it, and it provokes many questions such as "who were they? What did they look and sound like? Were they blood-related, a family, or a community? Was there a purpose for this painting beyond amusement? What did this mean to them at the time? How were they feeling? We can only speculate today.

But what role do such creative expressions play in influencing the course of human history, in terms of paths that are chosen, responses to changing situations (environmentally, socially, politically etc.)? Has art served to lead humankind and help guide us in some way, in times of adversity? These are interesting questions, however, the answers might prove to be elusive, although there are modern examples of how the performing arts, in particular - music, has served its purpose by motivating and boosting morale and thereby encouraging people in times of threat and duress, for example during the two World Wars of the 20th Century.

Fig.3.1. Hand paintings, discovered in Cueva de las Manos
in Santa Cruz, Argentina. Are they the work of women?

In general, drives and instincts operate either by generating a behaviour directly, or by inducing physiological states that lead individuals to behave in a certain way, mindlessly or not. Virtually all the behaviours ensuing from drives and instincts contribute to survival either directly, by performing a life-saving action, or indirectly, by propitiating conditions advantageous to survival or reducing the influence of potentially harmful conditions. Emotions and feelings, which are central to the view of rationality are a powerful manifestation of drives and instincts, part and parcel of their workings (Damasio, 2006)

In order to move closer to understanding the opportunities for art and science develop public engagement, we need to consider the knowledge that is currently accepted within art and human behaviour. This review of literature represents a scientist-artist's perspective which considers how art impacts on the human brain and how the brain produces physical responses as action. It also considers how human beings are motivated to act, from a scientific perspective. However, the very subject of art and the human brain are both subjects which remain in part – a mystery to mankind and its experts in the field. Having trained as a scientist and as a practicing oil painter, the author has first-hand experience of what she would describe as a symbiotic relationship between art and science, and one which she took for granted,

overlooking their interdependence for many years. The starting point of this critical review is that a linking-up of the ideas, understanding and evidence, when applied to art and science, could produce a more effective vehicle for delivering scientific knowledge (and conveying messages) to the public, one which engages them and helps us to move closer to a more resilient and sustainable way of living within our changing environment.

At the start, the review returns to some of the basic scientific discoveries and theories surrounding the relationship between art and the human brain, and what difference that might make to our understanding of science. This approach is designed to contribute to research on the ground, thus improving the quality of the final interpretation and analysis of field data. To this end, the literature search has been broad-reaching, involving the selection of relevant articles and books dating back to the Middle Ages, for an insight into early philosophy on aesthetics, then jumping forward in time to the 20th Century and Robert M Ogden's "*The Psychology of Art*" (1938), which offers a thorough examination of art in many forms and its potential to influence behaviour. Other themes that are considered are culture, language, diversity, personality types and corresponding triggers for motivation and action, like-mindedness and perception. Ultimately, the aim is to determine if art and science can generate something together, that will influence the public to make changes within their lifestyles, as a long-term strategy for surviving the impacts of climate change.

The consensus seems to be that we can gain value from art-science in collaboration. Science discoveries and questions give rise to new ideas for artists and visual art can be an effective way of conveying a message, information or idea. But does the use of art in communicating science influence humans to have altered behaviour within a community? Is it about influencing one key individual who can then influence the rest of the community? Or will it be necessary to influence people en masse by applying the like-minded principle through collective intelligence (Levy and Bonnono, 1999). The reasoning behind this question is that if only a minority of people engage with art, it might not have the impact it needs to influence people's behaviour within a community, unless it relies on the right person being influenced who can inspire others.

People can be moved, shocked, entertained, bored, annoyed, and inspired by art, but which of these impacts or effects might lead to a change in behaviour? Do positive impacts influence behaviour, or does it depend on the individual's personality type and motivational responses? For example, people are either motivated to move away from something (termed "*away from*"),

or motivated towards a goal (termed "*towards*") (Charvet, 1997). The larger proportion of people it is claimed fall between the two. In accordance with this theory, shock tactics might only work on a proportion of the community, in bringing about a change in behaviour. The same would apply to a programme designed to inspire people. Is an approach which actively sets out to influence human behaviour in the environment ethical? That might depend on the saliency of the cause, perhaps, and who the stakeholders are.

The reviewer's own motivation comes from being a practising artist and having a desire to understand the powerful and mysterious power of art. The ambition is to understand what happens in the human brain when it surveys the colour, form and texture of an an artistic visual which leads us to examine findings in neurology and the psychology. How are biological messages converted into thoughts and emotions? What are the other factors that play a part, (e.g. previous experience, information, culture, language, environment)? Then – how effective can humans be at creating art which will have any measure of impact on another human being, and how much of it is done (or received) consciously? Does it make any difference which gender you are or whether you are alone or part of a group? The subsequent stage for exploration would be –how can all this understanding be used in practice for a desired outcome, such as influencing the behaviour of a community and what is the added value derived from collaborations with science? There may be merit (and possibly a discovery to be made) in going back in time to a point well before our enlightenment and awareness of our role in our natural environment and of climate change[14].

Today, the idea of ownership, property, trespass, accusation, compensation and mitigation is encouraged and promoted. Even the 2013 well-intended promotional message by the RSPB which encourages young people and adults to "*Give Nature a Home*" implies that we have the power to give and to take away, within the natural environment. A humbler version might have read something like "*Share your home with nature*".

[14] The late 1940s and 1950s was the period that that saw the beginnings of the Environmental Movement. The 1940s witnessed the introduction into agriculture of the efficient insecticide dichlorodiphenyltrichloroethane (DDT), and the subsequent publishing of the book by biologist Rachel Carson "Silent Spring" in 1962 which highlighted the potential and unnecessary harm that large scale and indiscriminate spraying in the USA could be doing to wildlife and humans. The Countryside Commission was set up in 1967 in the UK, and the Royal Commission on Environmental Pollution in 1969.

## 3.2. Light, colour and rhythm.

The use of the word art within this review is applied loosely to refer to the creative, visual art of humankind. For this review, no clear-cut dividing lines are made between different crafts, styles, techniques, genres, schools of thinking etc. and the word art is used loosely to encapsulate all those creative activities and products which have the same basic motivation and function.

Unlike some earthly creatures, humans thrive on light…from the sun. Sunlight can make a considerable difference to mood. The general well-being and the lack of - or restriction of sunlight, is recognised as a debilitating health condition, for example S.A.D. or Seasonal Affective Disorder which brings on a state of depression that has a seasonal pattern. The reducing hours of daylight in autumn can trigger the onset of low moods and a lack of interest in life, which become more severe during December, January and February (NHS 2014). The National Health Service states that sunlight can affect some of the brain's chemicals and hormones although it is not clear what this effect is. One theory is that the light stimulates part of the brain called the hypothalamus, which controls mood, appetite and sleep and the lack of light is thought to affect the production of the hormones melatonin and serotonin as well as affecting the body's circadian rhythm, its internal clock which regulates several biological processes during a 24-hour period. It is reasonable to suggest that the illuminating nature of some art could stimulate the brain in a similar way, affecting mood and outlook.

Light and colour influenced the thoughts of medieval thinkers on certain characteristics of beauty, such as radiance and clarity, (I.E.P., 2010). Their motivation was based on their belief that "*God is Light*" and quotes Plotinus (204/5 – 270 C.E.) who wrote:

> "*the simple beauty of a colour is derived from a form that dominates the obscurity of matter and from the presence of an incorporeal light that is reason and idea*".

Incorporeal light, for Christians, is God's light and gives splendour to the whole creation:

> "*Light is what allows the beauty of objects, especially their colour, to become illuminated, in order to display their beauty to the fullest".*

Pseudo-Dionysius expanded on these thoughts:

> *"And what of the sun's rays? Light comes from the Good, and light is an image of this archetypal Good".*

It appears that the connection is between light, colour, radiance and hence the good and ultimately *beauty*. Light, and thus colour, could also be associated with creation and maybe creativity itself, and the effect on the receiver[15] of certain qualities of light are potentially significant i.e. the quality of light and colour could be influential to mood (N.H.S., 2014) and thus decision-making and behaviour. The hypothesis might be that radiant light will provoke optimism, hope, open-mindedness and a willingness to act or co-operate, whereas poor quality light and dull colours will stimulate withdrawal and rejection as a means of self-preservation.

Regarding individual responses to colour concerning the reviewer's own oil paintings, there are two interesting examples. Figure 3.2. relates to an instance where a blind visitor to her exhibition in St Davids, Pembrokeshire in 2011 commented delightedly about a deep red painting she could see. It moved her emotionally as it was one of very few paintings that she could see and experience. Figure 3.3. relates to an example of how two people in a close relationship, can have opposite, responses to the same paintings. These are included below for illustration. The first painting (left) "*Flaming Ambition*" is dominated by strong *reds* whilst the second painting (right) "Gannetack" is dominated by *blues*.

Fig.3.2. "*Flaming Ambition*", (left) R. Field (2011)
Fig.3.3. "*Gannetack*", (right) R. Field (2010)

[15] Photoreceptor cells convert light (visible electromagnetic radiation) into signals that can stimulate biological processes, triggering a change in the cell's membrane potential. The two classic photoreceptor cells are rods and cones, which do not contribute to sight directly, but are thought to support.

The female within the relationship commented, quite passionately, that she was drawn to the red painting because it moved her emotionally. The impression she gave was that it had been a positive experience for her. However, for her, the blue painting (Fig.3.3.) was disturbing and gave her an uneasy feeling, whereas for her partner it was attractive and positive, and the red painting (Fig.3.2.) was disturbing for him. Allowances are made for the additional influence of the subject matter and energy depicted within each, although judging by their comments, their individual responses were largely due to the colour-schemes and their different and contrasting personality types (and it is these personality contrasts that have brought them together as a couple). One party, it seems, wants to be emotionally moved and the other does not, a head versus heart combination perhaps. Chapter 4 describes how colour was experimented with in the field research, within the context of global warming, and discussed in Chapters 6 and 7.

Subjectivity within the viewing and experiencing of art is commonly accepted but significance is found within how the impact of art on individuals can vary depending upon their personality type and motivation traits (Charvet, 1997; Ogden, 1938) and even their gender, perhaps. Based on this theory modified for this research, there is perhaps an opportunity to make more of an impact by catering for individuals or types.

Ideas about rhythm were developed by St Augustine (AD354-430), who set the stage for medieval Christian philosophers and made a sharp distinction between the creation of God (*ex nihilo*) and artists (*ex material*) as God's creation was not related to the notion of mimesis unlike perceptions of art. Augustine's belief was that rhythm originates with God. He compared people's conventions for varying ways of pronouncing words, whereas mathematical truths cannot be determined by convention and have already been determined. The distinction is that rhythm, like mathematics can only be *discovered* by people because it is already determined in God.

Number, for Augustine, measures rhythm (I.E.P.,2010). Rhythm is based on number, which Augustine believes is immutable, then it follows that rhythm is likewise immutable…in all the arts it is symmetry[16] [or proportion] that gives pleasure, preserving the whole and making the whole beautiful. Furthermore, it suggests that Augustine believed "*the degree to which things are in their proper place is the degree in which they are beautiful*". Sandro Botticelli painted

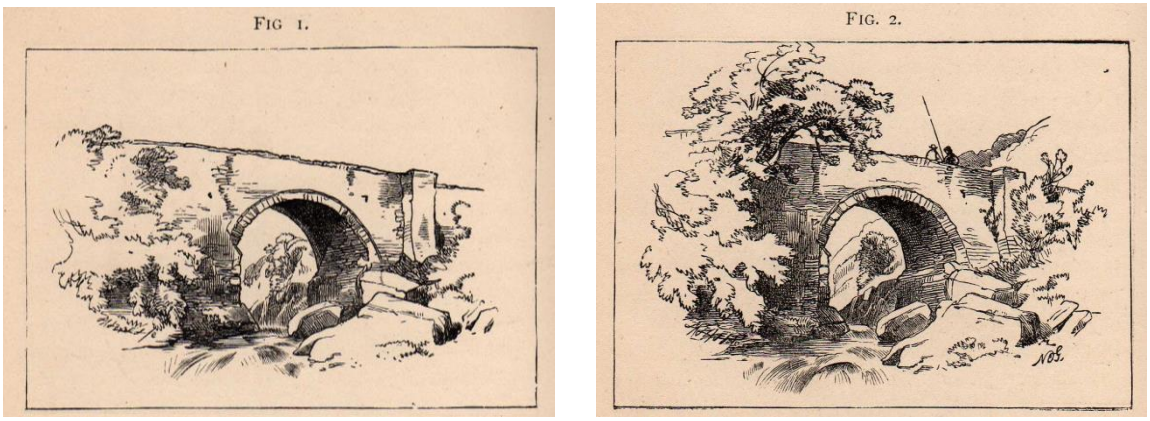
[16] Symmetry: Oxford Dictionary online offers several definitions including – "Correct or pleasing proportion of the parts of a thing".

a portrait fresco of him a thousand years later (1480), in which he is depicted looking up towards the light, with his right hand placed near to his heart and with a thoughtful, frowning expression on his face. Botticelli's creation gives Augustine credibility as a philosopher and saint by conveying the idea that he cares about the things that matter, in his interpretation.

So, what does proper place mean? Does this translate into a balance for example in a painting or drawing (and in other visual art too), whereby the composition of 'parts' or elements of the picture either work or do not work – there is no in-between. Balance in composition is instinctive to the artist in most cases, with no teaching, although some basic principles in compositional balance can be taught (Rankin Poore, 1977), i.e. "*rules of thumb*". A simple instruction can be found at http://www.finearttips.com/2009/04/rule-of-thirds-composition/ .

Figure 3.4. illustrates the improvement of a composition to strengthen its visual impact and is found in "*Hints on Sketching From Nature*" (Green, circa 1880). It explains that composition is very valuable, its principles enabling us to obviate that which is unfortunate or to strengthen that which is weak, and so to arrange the whole subject as to produce the "*highest amount of pleasure that it is capable of yielding"*.

Fig.3.4. George Rowney & Co's circa 1880; "*On Composition*"; pp41-48




Green says:

> *"The unpleasing effect of the unbroken line of the bridge (Fig. 1) is obviated by the addition of the bough, selected, it may be, from some neighbouring tree, and also by the introduction of the figures (see Fig. 2). In this case the advantage arising from a small amount of composition is so evident that it needs no argument to defend its use; but instances constantly occur in sketching where this principle may be employed, but in which the benefit resulting from its application is not so palpable*." (Green, circa 1880, pp41-48)

As can be observed by this example (Fig,3.4.), the second sketch which includes the extra trees and human figures is more attractive and somehow feels more complete, therefore satisfying, and yet it is difficult, even impossible to explain why. Therefore, it is fair to say it "*needs no argument to defend it*" or more accurately, no argument can fully explain it. However, we know how to achieve it. It is a curious thing, the wonder of the importance of proportion in the visual, to our experience and connection with it, or simply its impact on our brains and bodies. It is easier to explain what makes for a stronger composition, than it is to explain why it matters - but somehow it does. There are examples in the natural environment of balance and proportion with the design and structure of plants e.g. florets and seeds, and animals e.g. snails, and recognised as the Fibonacci Sequence (1202). Strength of composition is explored within the field research and discussed in Chapter 6.

Human behaviour is driven by individual motivation. Sometimes the source or catalyst for the motivation is not easy to identify. Charvet (1997) provides an insight into Motivation Traits which are based on categories that Rodger Bailey, creator of the Language and Behaviour Profile (LAB) in the mid-1970's and labelled *Proactive/Reactive*, *Toward/Away from* and *Internal/External*. These concepts have been modified and experimented with in the field research and discussed in Chapter 6.

Although Charvet (1997) does not relate directly to art in terms of communication, it is relevant and useful when it comes to considering the motivation and other factors that might influence a person's response to any given stimuli. Her work helps us to understand why individuals might respond differently to the same communication, in a straightforward way, which is relatively easy to explain. With this better understanding there is potential for experimentation and a testing of ideas that could lead to a more effective way of engaging people e.g. within the community, through arts projects. In defence of an approach which might sound too contrived within the creative field of art (i.e. custom-designed), it could prove effective as a means of understanding why certain arts-based community programmes might not *appear* to have any significant impact on a large proportion of the population (Clements, 2007). To date, evaluators of community arts programmes have experienced difficulties in extracting tangible, measurable outputs (Matarasso, 1996a; Newman *et al*, 2003). The analysis stage of the data collection stage of the research would also need to factor-in these ideas. There are many personality-type studies and theories to be found within psychology, for example Carl Jung (1875-1961), Myers-Briggs (1985), some of which have been adapted for the workplace

towards an improved communication and motivation e.g. Charvet (1997). For example, if we were co-ordinating a community-based arts programme or an experiment that will be followed by an evaluation or analysis, we might apply Charvet's (1997) modified use of Bailey's LAB Profile categories, as shown in Table 3.1.

Table 3.1. Hypothetical application of Bailey's (1972) LAB profile

| Category | Proposed method for managing type | Rationale behind method | Application |
|---|---|---|---|
| PROACTIVE | Hand-over/delegate responsibilities to; invite ideas; provide short briefing; let them get-going early-on with tasks/involvement. | Respond best to action, short sentences and opportunities to initiate; better to keep them busy and avoid them 'rocking other people's boats'; unable to sit for long periods. | Demonstrates participation and encourages others. Helps event look popular and successful. Outputs easier to achieve and quantify. |
| REACTIVE | Take the lead; give gentle encouragement; allow time; provide information and nurture; allow plenty of time for participation. | Need time to think, observe and gather information; they may act eventually, or may not but will analyse the situation and let others go before them and can sit for long periods. | Increases participation numbers and could provide depth within the feedback process. |
| TOWARD | Provide goals, incentives and gains. | Better motivated by something to aim for and energised by goals. | Rewards can be built into programme to encourage participation and feedback. Could change behaviour through perceived gains. |

| | | | |
|---|---|---|---|
| AWAY FROM | Remind of threats, hard work, struggle, loss, cost, regret. Provide help with 'avoiding'. | Better motivated by things they want to avoid. Energised by threats. | More complex but interesting area to trial - to what extent does behaviour alter in the face of fear compared with dangling carrots? |
| INTERNAL | Allow self-management with little influence; listen-out for clues. Expect this person to treat orders as information and do not try to supervise them. | Will motivate themselves and judge themselves, despite what others say or do. | Not easily influenced but could make sound judgements which could be useful to evaluation process. |
| EXTERNAL | Show how; demonstrate, share opinions and provide instructions/ data; look-out for body-language cues. Instruct them in an authoritative manner. | Need other people's opinions and outside direction plus feedback. Motivated when someone else decides. | More likely to follow the crowd; feedback could be influenced by group response, which is equally as important and probably most common. |

.

The ideas in Table 3.1. are based on extracts from Charvet (1997). The *Proposed method for managing type* column is an approach to the categories of motivation traits. This illustration is dependent upon being able to establish which category participants fall into. It is, however, a simplistic portrayal of a methodology for engaging people which is more easily described than practised, although it could go some way to explaining why the success of community arts programmes is difficult to assess (Newman *et al*, 2003; Clements, 2007).

Charvet states that most of the population can be categorised equally e.g. 60-65% equally proactive and reactive, and the distribution of *Toward* and *Away From* is 40%/40% with 20% falling equally between the two traits, (similarly for 'Internal' and External'). On this basis,

there is scope for designing programmes that are sympathetic to all categories and thereby have the potential to maximise the opportunities for both participation and evaluation.

Could this observation of different motivation traits go some way to explaining the "*growing disinterest by the public, in Climate Change*" as reported by BIS (Department for British Innovation and Skills) in 2010? Head of Qualitative Methods for Ipsos Mori - Sarah Castell (2011), reports the percentage of people surveyed who believe that the climate was changing, had dropped from 88% in 2008, to 60% by 2010. For some people, the extreme weather and winter floods of 2013-2014, were a wake-up call and an indication of relatively sudden climate change. Politicians, even some who previously leaned toward climate change scepticism, now claim these extreme weather events are the result of climate change rather than inadequate flood defences (UK Data Service, 10 March 2014. http://ukdataservice.ac.uk/news-and-events/newsitem/?id=3740).

Perhaps it is not the message being conveyed that is disengaging people, but the style of communication. For example, *Toward* type personalities would (in accordance with Bailey's work Context theories) engage best with the promise of a brighter future around the corner, whereas *Away From* types would engage best with reminders of how bad things could get if we do not act now. On convincing people to act, Charvet (1997) talks about the decision-making process (page 135). She shows how Bailey observed the distribution of channel patterns, or how someone becomes convinced through their sensory channel, among different people. It represents how different people need certain channels of communication or interaction with information to be convinced enough to act. There are two phases in this process, it says. First, people will gather information in a specific sensory channel known as the Convincer Channel, and then they will treat that information in some way, known as the Convincer Mode.

Table 3.2. shows the preferences for the four convincer channels. Bailey (1970s) found that more than half of us need to visually "*see*" a product, service or idea, just less than a third of us need to "*hear*" something, a very small percentage (3%) will be convinced by "*reading"* and a modest 12% will need to "*do*" something

Table 3.2. Sensory influences on motivation to act (Bailey, 1970's).

| SEE | HEAR | READ | DO |
|---|---|---|---|
| 55% | 30% | 3% | 12% |

From an art-science collaboration perspective, the most significant result here is the importance of seeing and the relatively small percentage of people who can make decisions though doing. It leads to the question of the effectiveness of a participatory community-based arts project compared with, let us say for example, a public exhibition or demonstration, when it comes to engaging people and influencing human behaviour. Just imagine if art itself was a being, it might be classified as *Proactive, Toward and Internal*, in other words, it is procreative, aspires to ideas and is hopeful, but at the same time introspective. What are the implications of this, and does art, and particularly community-based arts projects, have a functional role that can cater for individual motivation traits and convincer channels?

With regards to the definition, Ogden (1938) describes aesthetic behaviour as "*undiscerning*", and perhaps therefore innocent. This undiscerning behaviour could be linked with Ramachandran and Hirstein's (1999) more recent theories on the unconscious mind which includes instinct. Ogden (1938) proposes that behaviour occurs in a field of forces, both attractive and repellent:

> *"The living creature behaves in accordance with its likes and dislikes. In the main, it is a liking creature. It seeks what it likes, and avoids what it dislikes. Taste, in the general meaning of the word, rules even the simplest and most primitive forms of behaviour; and as Leibnitz[17] remarked, it rules without reason."* p.4.

However, Ogden (1938) argues that there *is* reason, even though the creature does not know it. His simple formula (as he puts it) is: "*An organism is directed in its environment by its needs of the moment"*. He continues by defining two kinds of needs among many, (1) to be active in some definite way, or (2) to be passive and self-contained.

[17] Gottfried Wilhelm Leibnitz (1646 - 1716), Mathematician and Philosopher; made the definition of 'aesthetics' which was named by Baumgarten (1714 – 1762), thus giving the word new significance and thus its modern usage.

This analysis echoes that of Charvet (1997). For example, her *Proactive, External* personality classifications might be compared with Ogden's needs-(1). Similarly, Charvet's *Reactive, Internal* personality might fit with his needs-(2). There are further comparisons to be made between Ogden's (1938) work and Charvet's more recent and applied approach.

These theories are useful in helping us to invent or design ways of influencing behaviour using visuals or aesthetics in art. Ogden (1938) divides the need for action into two – (a) positive and (b) negative and then the two forms of active behaviour are divided into (a) approach and (b) retreat. Again, we might interpret these as Charvet's Toward and Away From. The principles are very similar and could be re-designed or customised to become part of a methodology for art in communicating scientific knowledge and beyond.

Ogden (1938) offers what might be considered a pleasing and realistic definition:

> "*A work of art is a unique expression, and its appreciation reproduces something of the artist's own impulse. If criticism then follows, it may be either constructive or destructive. If constructive, the expression will be recomposed and its meaning recreated; if destructive, the pattern will be destroyed, and possibly replaced by another. The great works of art resist destruction. The foundations which the artist has laid are so sure and so firm that the observer must accept them, not only as a unique expression of the creator's intention, but also as a plan upon which he can build his own structure of beauty; for beauty is an experience which expands and grows from the seed which the artist plants."* (pp.20-30)

Unsurpisingly, 76 years ago, in 1938, it seems that efforts to measure artistic effectiveness had proved unsuccessful, however, in the endeavour to quantify art-effectiveness, a formula which dealt with the same pattern of impulse and expression was formulated by Birkhoff (1933)[18]:

> **M = O/C, where M is aesthetic measure or value, O is aesthetic order, and C is complexity**.

Birkhoff's (1933) formula is included as an example of how the measurement of the effectiveness of art is attempted by mathematicians. What they seem to have in common with the sciences in general, is an ambition to understand the mechanisms of art. This is to some extent, an ambition that many art-enthusiasts would relate to, however the likelihood is that we

[18] George D. Birkhoff, Aesthetic Measure, 1933.

will never have a "*Manual of the Mechanics of Art"*, metaphorically speaking. Furthermore, many works of art satisfy their creators, yet fail to satisfy any one else, yet we all stand in need of art, and teachers lack faith in the intuitive guidance of art (Ogden, 1938).

Abstraction away from exactitude could be the necessary route to meaningful representations (Zimmer, 2003). The example of the parable by Jorge Luis Borges in which a group of cartographers make increasingly larger and more accurate maps of their mythical country until they arrive at a full-size map is highly amusing, as is the mental image it conjures up of people trying to find their way by use of a massive "*super-map*". The parable's title is "*On Exactitude and Science"* and Zimmer draws attention to the idea that it might be a critique of science as a way of describing the world, or it could be read as saying that exact sciences must be built on inexact representations. Either way, it reminds us that we can create impressive works but they do not necessarily help us to achieve our ultimate goals.

Zimmer's (2003) ideas that artworks are created by us, we are created by our artworks, and this two-way effect is deeply rooted, affecting both a culture's ways of perceiving the world and its ways of remaking the world it perceives. Zimmer's (2003) discussion of Gombrich (1960) when he says that "*artwork trains the viewer – it teaches him or her to see the 'world afresh*'" suggests the potential influence that an artist may have within the community. He claims that the painter has been trained by looking at other paintings, but occasionally, a painter will see in a way that no-one else has seen before. This could be considered as genius, or simply a unique interpretation of the mind's eye, for art is a unique rapport between heart and soul, brain, eye and hand (or foot or mouth).

Gombrich (1960), who is said to have written extensively on the links between perception and art, explains how artists' perceptions of the world are informed by interpretations that are founded on the schemata, i.e. strategies for interpreting and recreating the world, that they have learned from other art and modified. From an artist's perspective, this explanation is somewhat simplistic and could even be considered condescending.

Perceptual experiments are claimed to be inherent in some abstract art, what Zeki (1999) calls techniques unique to artists. Where the spectator or viewer plays an active role in understanding or engaging with art, he uses abstraction, and this can lead to new insights about perception and conceptualisation. This appears to be the potential for new learning within Zimmer's work.

Although Salovey and Grewal's (2005) do not discuss about the role of art, it discusses emotional intelligence and examines methods for measuring, which could provide an insight as to why only certain members of the community will engage productively with art projects. It presents the Four-Branch Model of Emotional Intelligence which has been broken down into four proposed abilities that are distinct, yet related. They are perceiving emotions, using emotions, understanding emotions and managing emotions.

Emotional intelligence in context means that to use these skills, "*one must be aware of what is considered appropriate behaviour by the people with whom one interacts*". Central to the four-branch model is the idea that emotional intelligence requires attunement to social norms.

There are two areas of interest here, first the possible link between like-mindedness, collective intelligence and social norms when it comes to responses to art and behaviour within the community, and secondly, the potential for the measurement of emotional intelligence to provide useful knowledge that will contribute to the design of data-collection research, in particular, the interpretation and analysis process.

There are two main questions to explore in relation to this study and they are – how do art and emotional intelligence relate or connect with each other to influence behaviour, and what influence does the social norm and the social context have on this connection?

To the person on the street, our creativity and enjoyment of works of art is largely taken for granted. However, as scientists, Ramachandran & Hirstein (1999) are puzzled by the question of what *biological function* this mysterious behaviour could possibly serve. This is an interesting way of looking at the subject of art or creativity. It reminds us that art has not necessarily come-about by chance without an obvious plan or cause, or by means of human manufacture. It is possibly a vital piece of nature's great design.

This is a neurological perspective on the brain circuitry involved in our response to the visual stimuli, which is produced by art. Ramachandran and Hirstein (1999) suggest that these may be the first experiments designed to empirically investigate the question of how the brain responds to art. Experiments with rats, demonstrate a distinct response to exaggeration. Ramachandran refers to this as the "*peak shift principle*" within the study – a well-known principle animal discrimination learning process. It forms part of the evidence for a proposed list of "*Eight laws of artistic experience*" which include the effects of caricature, grouping, and correlations within areas of form, depth and colour. Their conclusion is that art is most

appealing if it produces heightened activity in a single dimension and suggests that it can help to explain certain brain conditions.

There are confidently expressed and ambitious ideas presented within this work, such as a "*quest for artistic universals*". Their eight laws of artistic experience are said to be a set of heuristics deployed by artists to have impact on the brain. The art world might object to the use of the word "*laws*" within artistic experience, but they are proposed in a playful spirit and contained sufficient merit to be published in a philosophical journal. Ramachandran and Hirstein (1999) are keen to convince us that artists exercise a power over our neural mechanisms, through capturing the *essence* (or rasa in Hindi) of an object and amplifying it, either consciously or unconsciously. This theory suggests that it does not happen by accident, although many things will influence the unconscious mind, which are not accessible by the conscious mind, including *instinct.* It is possible that instinct is what makes the difference between a good artwork and a great one.

Ramachandran and Hirstein (1999) are not the first, and will not be the last to attempt to explain the mystery of art for a better understanding of how it works. This study was published fourteen years ago, and there is little evidence of any significant progress in this area since. What it does provide is evidence of changing behaviour in rats when exposed to increased contrast. It is possible that art can capture essence or rasa and inflame it so that, via the brain, the human body can feel what his eyes have become so accustomed to seeing that he cannot be fully impacted by it.

Zeki (1999) proposes there is modularity, a functional specialisation, in visual aesthetics. He is referring specifically to the brain, which, it has been discovered in the last 30 years, is composed of many different visual areas that surround that which Zeki (1998) labels V1 – the visual brain. He explains that each group of areas is specialized to process one attribute of the visual environment by the specialized signals that each receives from V1, which acts as a post office, distributing different signals to different destinations. He also proposes that art has the same function as the brain itself, although refers to art on canvas and therefore, paintings. He confesses he holds the "*unusual view*" that artists are neurologists, studying the brain with techniques that are unique to them, reaching interesting but unspecified conclusions about the organisation of the brain. His conclusion is that "*the function of art is therefore an extension of the function of the brain – the seeking of knowledge in an ever-changing world"*. p.12

Zeki (1999) poses the question of whether a man being born blind, having learned to distinguish between forms by touch alone, would be able to distinguish them by sight alone when vision is restored to him. With concern for the yearning of artists such as Picasso and Matisse, to be able to see and paint the world as a child does, Zeki (1999) claims that:

> *"visual apprenticeship of children occurs at a very early age, before two, and begins immediately after birth, long before the motor apparatus has developed sufficiently to be able to execute a painting. In its conceptual immaturity and technical simplicity, the art of a four-year-old child may be touching and even exciting, but it is the art of a visual brain that is already highly developed and that has acquired much knowledge about the world. The innocence that artists yearn for is, in terms of the brain, a myth"* p.93.

Another perspective on this is that the yearning that Zeki claims is common among artists is more to do with a desperate need to escape the torment and frustration that comes with great talent – to a place of purity and innocence, unencumbered by knowledge, responsibility, and social pressure, and less to do with how children paint or draw. But perhaps that is what these artists were trying to say.

This leads to puzzling over whether using art to inform or communicate knowledge requires an extraction of the innocence within the creative work. Alternatively, perhaps it is the innocent element that is the most powerful conveyor of ideas. A return to innocence might be the ante-dote for ignorance.

Furthermore, there is a marked difference between the brain's reactions to abstract images compared with representational ones. It is proposed that artists are unknowingly exploiting the organisation of the brain (Zeki, 1999). Whether artists are knowingly or unknowingly exploiting the organisation of the brain, remains a speculative matter and its relevance to art-science collaboration discourse is uncertain. However, there is no reason to doubt that the experiment is reliable in proving that abstraction in the visual produces a different neurological response to representational ones. This potential difference is explored within Section 3. of the experimental field research, and discussed in Chapter 6.

Within the field of neurology, what constitutes great art is *"art that fits as many different concepts in as many different brains over as long a period as possible"*. Ambiguity is an important part of all great art as the brain has the capacity to interpret things in different ways, as it acquires knowledge. There is a difference between the ideal and the reality. The unfinished

state of the work of the artists is significant. The artist cannot replicate/represent/capture the experience as the ideal in the end, which is frustrating, but to complete the work would leave it unsatisfactory and failing to achieve the goal. Therefore, in coping with the *real* world, the brain takes refuge in works of art for its failings. Sigmund Freud's words: *"civilisation is discontent*" suggests there is a clash between visualisations in the brain, and what really happens (Zeki, 2012). The dream can be (or is often) better than the reality, or so is often said. Perhaps this is unrealistic to begin with as dreams and reality might never be comparable; and what is reality? Ultimately, the human condition favours being able to dream, however likely dreams are to come true.

We can gain far more by creating than by replicating. Is it more than likely because we do not fully understand the nature of the reality to capture it by replication, so we re-invent it in a way that gives us the emotional experience that we long for? It is in seeking that we are satisfied, and in inhabiting the spaces we create by our own hand. This is where we reconcile our physical existence with our experience of it, perhaps.

Whereas art historians having failed at communicating their ideas about periods in art history as well as individual artists, to the larger public, and scientists have only been interested on a universal basis (Zeki, 2012), today there is a relatively urgent imperative to reach all the people on a local level, through art and through science, which could indicate a turn-around.

## 3.3. The pressure points

Electronic communication and social networking will presently be having a humanizing influence on us and will foster the emergence of a collective intelligence – a meeting of minds (Levy & Bononno, 1999). The implications are that the influence of art-science collaboration on human behaviour could depend on a collective meeting of minds as opposed to an independent viewpoint. This could have a bearing on the design of art-science programmes. Within this, is the idea that if you can influence one person, the right person that is, you can influence a whole host of people. This makes sense, for what we see repeatedly in the history of humankind is leadership and following. The difference today is the speed with which that movement can gather momentum – enough to become a substantial influence within society. However, once the momentum gathers a certain pace, it is possible that the degree of mindfulness would diminish, producing supporters who are no longer proactive but reactive. These are the individuals who choose to follow the group so as not to stand alone or be left

behind. This becomes the motivation behind their participation. It is possible that like-mindedness more than individual thinking produces higher numbers of people who engage with an idea, and this leads to altered behaviour.

In contrast, the collective meeting of minds during times of crisis in years before electronic communication was more likely influenced by central government. An example of such communication is World War II public information posters discussed in Chapter 5. These posters designed in cartoon form were aimed at uniting the public and influencing behaviour for defence and national security. Chapter 5 also examines how visual art plays a public role in times of environmental stress and includes examples of visuals produced during extreme weather events prior to the introduction of photography, and more recently for climate change awareness.

Individuals respond differently with varying success, to stress in their lives and within their environment (Reynolds, 1980). It reminds us that in accordance with Natural Selection (Darwin, 1859) not everyone can deal with life, but that culture plays a part. Reynolds believes that body and behaviour are linked and the mind can affect the body. He claims that there are limits of flexibility beyond which we break down, the body or "*physiological house*", under social strain, in other words "*the body succumbs*". His example of an individual who had recovered from autism, which he related to the impact of language impairment, helps us to understand how never knowing from one moment to the next what was going to happen necessitates defending behaviour. More than two decades ago, there was no legitimisation behind any planning for a new relaxed society in most post-industrial states but there was a need to aim, not for freedom from rules, but "*freedom within rules*". The relevance of biology in a societal context, is in highlighting the limitations of humans in relation to body talk, and humankind's biological entity in a cultural context, prone to breaking down (Reynolds, 1980). In the 1980s, the emphasis was on the struggle for maximum per capita production which is an interesting reminder of the vulnerabilities of man, and how the stresses we create can threaten our own race. Today's stresses might relate to climate change impacts and the need to change our behaviour.

Art within this context can be seen in two conflicting ways. On the one hand, used as a language for stimulating thought (mind), it could impose the same patterns on the biology of the individual as Reynolds' (1980) structures of society (p.258) by *"subjecting him to*

*characteristic stresses and strains"*. However, on the other hand, elements of art could bridge the gap and dissolve some of the societal stresses. Art could be good for the body or physiology. It is surely acceptable to use art as a means of relieving stress, for a generally happier society in the light of the doom and gloom of climate change impacts.

The connection between ecology and the human heart makes sense. Schroeder's (1996) people-orientated and ethnographic approach to assessing the experience of the natural environment, by listening, observing and analysing is valuable. Art specifically, is not referred to, however, a spiritual dimension and having a sense of oneness as a way of dealing with grief, places ecology in the heart of human well-being. Schroeder's (1996) reference to beauty and solitude is reminiscent of 17$^{th}$ Century Dutch Artist Johannes Vermeer's paintings which are popularly thought of as giving a sense of silence and anonymity, among other qualities, yet many of his paintings depict musical instruments. Perhaps silence or solitude is a catalyst for the emotional experience that Schroeder (1996) talks about, and the natural environment is the place in which to find it. In addition, he brings to our attention the idea that we should be concerned not only about the threat of endangered species but the importance of the *"endangered experiences"*. He highlights the need to include people's experiences of ecosystems within the concept of ecosystem restoration and sustainability. His experience of scientific disciplines has led him to the conclusion that *"scientists tend to be suspicious of emotion, imagination and intuitive experience"*, due to them being subjective and not measurable via scientific method. Maybe it has been a lack of motivation that explains why this might have been the case until recently, when the need to deploy new, more creative ways of communicating scientific knowledge, and engaging people has become prevalent.

Shroeder's (1996) need to "*look back*" to find the origin of values by listening to people's own words, could pay dividends. Charvet's (1997) different motivation traits could help explain why values would be likely to vary between people too, but Schroeder (1996) relates the different ways in which people understand the natural world to having "*different world-views*", resulting in a difficulty in understanding each other's "*different realities*" (p.20). The example used is Carl Jung (1924) and the Native American Indian who thought that the white people were all mad because they think with their heads, and not their hearts, like the Indians did. This is a good example of how cultural values are interpreted differently across the globe.

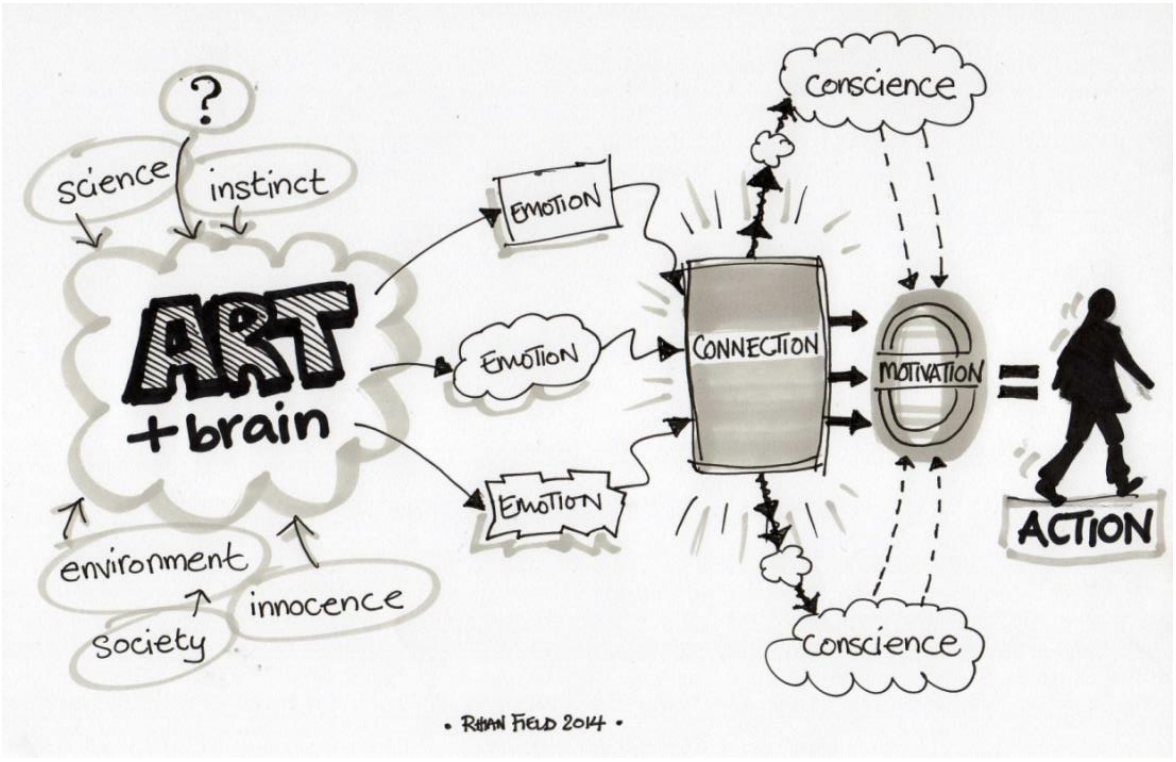
Figure 3.5. could serve as a formula for the process of human behaviour change which uses art as a catalyst for the eco-experience. It proposes that art stirs emotions, which help us to connect to our conscience, which in turn motivates us into action:

Fig.3.5. Proposed process of human behaviour change

**ART ⟹ EMOTION + CONNECTION ⟹ CONSCIENCE ⟹ MOTIVATION + ACTION**

Figure 3.6. suggests that art within a context is viewed and experienced by the brain, to stimulate emotions which connect the viewer to his conscience. The awakening of the conscience could be motivating and lead to action.

Fig.3.6. Hypothesis for the process of behaviour change,
through art and the human brain (© Field, 2014).



## 3.4. In Practice

When it comes to defining art, we find that it is not straightforward. There is no such thing as a finite list of qualifying creative acts or products to assist us. It is a matter of preference, opinion, outlook, experience, and is generally subjective. However, we can apply a more objective view when it comes to art's functions, and this is based on track record or what has been done before. The functions of art might be – illustrational, demonstrational, educational, for the conveyance of ideas or concepts, influential, for recording, entrepreneurial, promotional, for survey and surveillance, entertaining, and so on. Such are the examples of art relating to human crisis discussed in Chapter 5.

The idea of expeditionary art seems quite straightforward. We imagine it involves a skill for illustration and record-making, in pictures and drawings etc. Balm's (2000) compares it with canonical art - what he calls academy art, and suggests that expeditionary art's function is art for survey and surveillance (providing information), whilst academy art's function is to cater for aesthetic tastes. In support of Balm's (2000) argument, taste rules without reason (Leibnitz, 1684) and it rules the simplest and most primitive forms of behaviour, motivated by likes and dislikes (Ogden, 1928). Expeditionary art is *"mimetic, perspectival, referential and place-specific"* and there are three motivations for it, i.e. strategic, institutional and entrepreneurial (Balm, 2000). Entrepreneurial art could be persuasive, and expeditionary art might not be as immune to the influences of taste, as Balm (2000) would like to believe. His method of analysis and classification is not typical within the field of art. It has a strong *applied* focus, which emphasises a practical purpose. This is a geographer's perspective which is suggesting that in the past there has been a narrow view of the function and usefulness of art and that maybe we need to gain a more enlightened outlook by examining recent expeditions where artists are invited as members of the research team. One example of such expeditions is the international artist-led Cape Farewell project described in Chapter 2.8. Collaboration in Practice.[19]

Balm (2000) places expeditionary art within a greater scheme of visualisation in geography and stresses its growing importance within science in general. He makes a vital comparison between expeditionary art, photography and text, referring to Kern (1849)[20] whose picture of

[19] www.capefarewell.com

[20] "Pueblo of Zuni", Academy of Natural Sciences, Philadelphia.

Zuni offered a pictorial hypothesis about day-to-day domestic life by populating the scene and thus bringing it to life, helping to bring some sense of how and why the community functioned.

In an interview, Balm (2000) was asked how art and geography intersect, and how we benefit from this unique pairing. He replies with:

> "*Geography tells us where we are; art tells us who we are. Put the two together, and the connection is powerful. Artists have by-and-large given us our view of nature and shaped our decisions to preserve or develop our natural resources*".

This is perhaps a reminder that art is personal and it is human, which means that not only are we responsible for it, but we are also responsible for its influence.

Some collections of artistic works serve as records of change, such as Mc Innes & Bernstead (2013) which provides a snapshot of changing coastline through paintings and drawings etc. These paintings and drawings are listed in order of their usefulness in aiding understanding of changing coastline. They serve to inform coastal policy, and assist in the management of the effects of climate change. Comparative with Balm (2000), this type of artistic representation represents both the physical and the cultural. We can use it to monitor how geomorphological features have evolved through time for example by erosion and indeed accretion of sediment, coastal defences, estuary inlets and reclaimed land, maybe even relate them to meteorological records, and gain an insight into how the population engaged with the environment, occupationally, culturally and for leisure. It lends itself as an aesthetically-pleasing historical record, at the very least, but also makes for a celebration of Welsh coastal paintings that could prove to be unpredictably useful in the future, maybe in fifty to a hundred years' time, when climate change and sea level rise has impacted further.

Unique within Wales is Cof Cenedl (tribal memory) by Bala (1999), which introduces the idea of custodial aesthetics, history, identity, cultural tradition and the concept of people being guardians of their culture, through art. The chapter by Shelagh Hourahane, gives examples of where Welsh art can represent the Welsh identity. She explains that in the absence of an indigenous visual tradition, a contemporary culture is introduced to fill the vacuum. Statements by artists and essays on the links between art and identity are included. This is an example of the functionality of art, in this case, to establish or reinforce the national identity of a country. It could be interpreted as a very positive use of creativity and it is packaged in an interesting

way, however, whether the artwork itself, (some of which is illustrated in the book), represents the Welsh communities in general, and reflect all individuals' sense of national identity, is debatable. However, it provides the nation with something to show and to talk about, connecting with its history, culture, language and identity.

## 3.5. Summary

A wide range of literature has been reviewed, with relevance to the nature of art and its influence on human behaviour. Apart from recent studies by neurologists and psychologists on art and the brain, it was considered useful to look at art's influence historically, especially how it was viewed and understood. To this end, Medieval philosophy provided interesting insights. Alongside this tentative dissection of art, there has been an acknowledgement of the understanding that has been gained on what influences affect human behaviour, such as personality types, incentives, fear, communication methods, biology, brain design, visual stimuli, and society. One obvious trend throughout the literature search process was the growing curiosity and need to understand art, among scientists and geographers, presumably so that it's influence can be harnessed for the benefit of the population.

The literature review has stimulated a deeper curiosity of the nature of art, which deserves further investigation and study. These are grouped under the headings of Qualities, Functions, Applications, Mysteries and Communications, and is not an exhaustive list, however it draws on some of the themes and findings from this literature review.

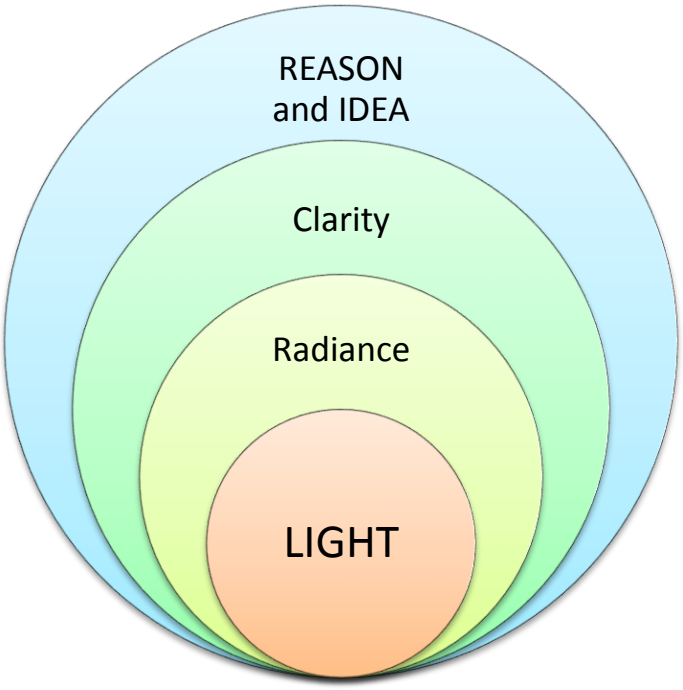
The degree to which human creativity and the biological role of art remain a mystery, beyond its practical application, and the continuing speculation and hypothesizing around art's mechanisms, is reoccurring within this review of literature surrounding art and human behaviour. Despite this cycle of exploration, the qualities of art provide infinite possibilities for application within infinite combinations. One outstanding area of interest is the importance of consideration for different human personality types when experimenting with art in the quest to convey knowledge. Response to art goes beyond subjectivity per se. The subjectivity could be influenced by many tangible factors that are relatively well-studied and understood, such as personality types, motivational traits, cultural and religious beliefs, societal structures, and community or collective thinking. These are explored in the field research and discussed in

Chapters 6 and 7. This subjectivity plays an important role however, in reminding us that we cannot always predict public response. There is the unconscious decision-making stage within subjectivity, which is followed by a conscious decision which can change the game completely. This is the power of human will, which is not always honest or even authentic, and can be driven by ulterior motives.

The connection that Middle-Ages philosophers make between quality of light and the human brain is relevant today. Fundamentally, without light, we cannot make sense of our world and environment. Light within art provides form by creating shadows and highlights. The contrast between the two produces the three-dimensional form. Natural light is constantly moving, increasing and decreasing in intensity (and colour temperature) throughout the daylight hours, and so our experience of our environment changes, too. What these philosophers were saying was that Light (= God) = Good and that Good = Beauty.

Figure 3.7. represents the relationship between light, radiance, clarity, reason and idea (and thus beauty), designed to reflect the views of Medieval philosophers.

Fig.3.7. Illustrating Medieval thinking on light
at the beginning and at the heart of reason and idea (Field, 2014).



Furthermore, their theory that Rhythm also originates with God and is pre-determined, in other words impossible for humans to invent, supports the argument that in art there are rules which determine its degree of impact. Even though the teaching of art since the mid-1950s has seen a promotion of free creative expression, it seems that the artistic dogma that Ogden (1938) says the educational institution saw fit to escape from, was more than likely the technical basics of the craft, or the rules of light, colour and rhythm. This would set one artwork aside from another, in terms of quality, impact and integrity, giving the highest amount of pleasure that it is capable of yielding, defying the limitations set by the notion of subjectivity, thereby *reaching parts that other methods cannot reach*. In other words, the modern approach to art encourages a higher participation in practice, but not necessarily the highest quality, and as Ogden (1938) says "*Great works of art resist destruction*".

Aside from teaching methods and rules of the craft, there is an element within artistic work that cannot be taught or replicated, but which determines the uniqueness of the work and the potential for its influence. That is the personality of the artist himself who has a dialogue with the viewer that does not employ words. It could be said that words serve only to dilute the essence of the work, and much of what takes place between the artist and each individual viewer could never be explained in words. That is not to say that the artist could not explain herself independently, just as viewers can describe how they think and feel, but there is a limit to the effectiveness of words. The artist sees what others had not seen and interprets it in such a way as to inspire others.

On the pertinent question of art's "*biological function*", from a scientific point of view (Ramachandran,1999), we might assume we are purposefully designed as a species to be creatively skilled in the practice and appreciation of the arts, and can justifiably conclude that it is critical to our survival; or put simply, we are *meant to use it*. If this is true, then society ought to consider art and artists with the highest regard, as they (unwittingly perhaps) hold the secrets to its survival. Likewise, science needs to invest in the interpretation of art.

Man's limits of flexibility (Reynolds', 1980) and the dangers to our biology from stress in our environment are possibly today's uncertainties that scientists speak of currently, in relation to Climate Change predictions. It is almost certain they have potential to cause stress. Reynolds reminds us of how fragile humankind is, which is something that we have become complacent

and perhaps arrogant about, with expectations of being protected physically, mentally, legally, medically, psychologically and financially, by our governing bodies, especially in the West and developed countries. Perhaps Schroeder (1996) is thinking along the same lines in suggesting that ecology should be thought of as a matter of the heart as well as of science. Art could be the biological catalyst that will offer relief from stress through providing the opportunity to experience a sense of oneness, and meditation for healing.

The artist is quite likely blessed with the abilities for perceiving emotions, using emotions, understanding emotions and managing emotions, some of which will be deployed unconsciously, some consciously, and some in such a way as to have a heuristic influence (Salovey, 2005). If artists are neurologists who exploit the organization of the brain (Zeki, 1999) one could describe them as a potential liability. This proposition is considered to have no practical application here, as it would be difficult to divide a line between what is done consciously and unconsciously (or knowingly and unknowingly). One could describe the art of extreme weather events, World War II posters and climate change visual art discussed in Chapter 5 as conscious and contrived with a purpose beyond creative expression.

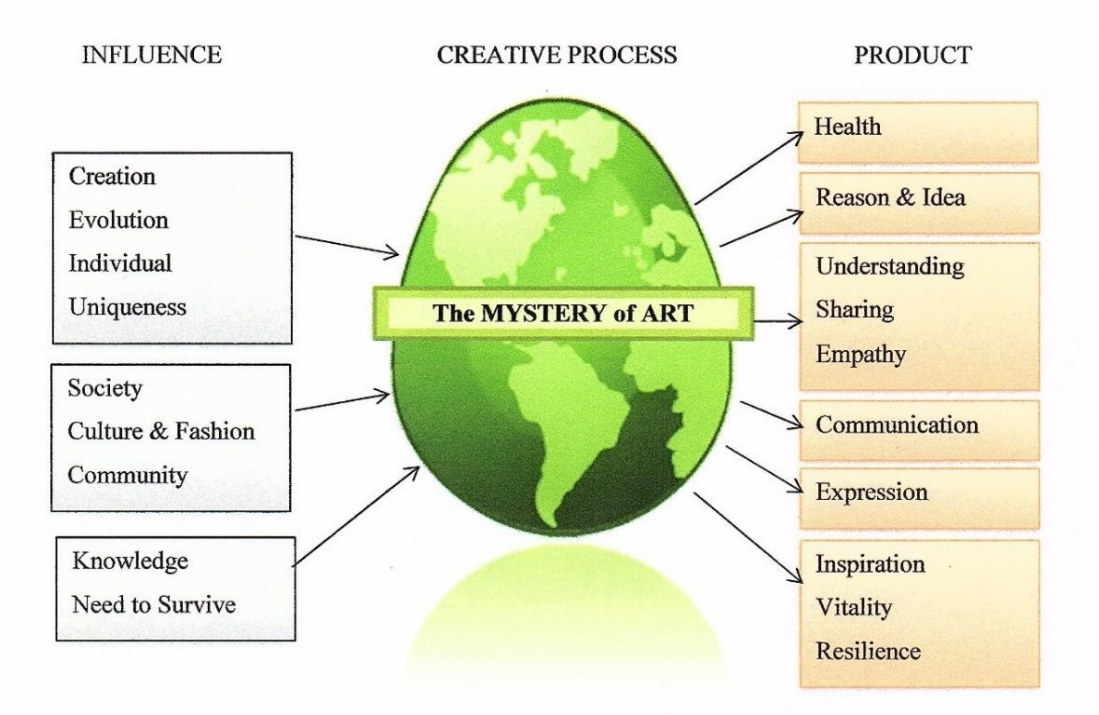
On science communication, it looks as though art can be influential and certainly assists in the process of making information more accessible, for the public. It supports education, is a universal language and can help us with hypothesizing. However, scientists need to be recruited as part of the support network, and an effective collaboration requires joined-up aims and objectives, even if the motivations and methods are different. Rodin (1911), artist and sculptor himself describes the meaning of art as follows:

> *"art is dead…our age is one of engineers and manufacturers, not artists…art is the most sublime mission of man since it is the exertion of the mind trying to understand the world and to make the world understood…beautiful works of art, which are the highest testimonies of intelligence and of human sincerity, say everything that one can say about man and about the world. Besides, they make us understand that there is something else that one cannot know."* p.4.

One of the most pertinent suggestions made by Rodin is that "*there is something else that one cannot know*", which is subject to interpretation, however, it could be reminding us of our vulnerabilities, fallibility and need for humility. It also inspires us to trust and believe in the potential for new discovery. Based on the thinking of a man who could be described as an artistic genius, it would be wise to partner-up science with art. Figure 3.8. is based on findings

within this review and goes some way towards illustrating the role of art within human existence, in which art is analogous of an egg-shaped globe, capable of procreation and un-measured potential for mankind.

Fig.3.8. Art and Human Behaviour – Diagram Field (2014).




The humbling aspect of this quest for understanding within art is that no one individual, whatever their experience, training or aptitude is more qualified or entitled than any other. We are all equal when it comes to consuming art and in our understanding of it. The simplest notion could be enlightening. Discoveries are often made by chance and not necessarily as a direct result of months or years of research and experimentation. On reflection, humankind seems to have only scratched the surface. It is perhaps pointless to search for the truth because everyone's truth is different and people *choose* different truths, especially when it comes to art. Is there anything to be gained from destroying the illusion? This is a deeply philosophical question.

However, the question of whether visual art and environmental science can generate something together that will influence the public to make changes within their lifestyles, as a strategy for climate change survival, still sits on the table of debate. This might be because we have not yet explored its potential with full conviction, and with a joined-up approach.

# CHAPTER 4: METHODOLOGY

## 4.1. Introduction

This chapter introduces the methodology, both conventional and experimental, for field research carried out within this project to explore and respond to the key research questions identified in Chapter 1. It explains the rationale, context, impetus and positionality of the researcher and then provides details of the planning and design for field research activities. Finally, in relation to the analysis and interpretation of visual data, there is a review of approaches to analysing images that have been adopted in the past.

Acknowledging that artists have the potential to engage society in emotional and experiential ways to promote cognitive and behavioural change, it is integral to meaningful communication between humans and the changing world. Art could serve as a catalyst for behaviour change, for example, through its ability to hypothesise, just as it has done for centuries (Chapter 3).

In an encounter with an artwork, the viewer is invited to engage in their own reflections and recall their own experiences to evaluate and interpret the work in a process of reflective thinking, to engage with private reverie to make sense of a public global reality (Duxbury, 2010). In view of a growing commitment worldwide to art-science collaboration as a way of influencing the public behaviour within climate change adaptation, a raft of empirical data collection methods was designed for this project to explore how the public engage with art, within a context, and consider its potential. Data were collected through field research methods designed by the author – a science-trained practicing artist. It included questionnaires, interviews, a climate change image poll and a unique field experiment involving a test-kit of bespoke oil paintings with related questions for participants.

## 4.2. Context

Pondering whether this function has a place in the Anthropocene, it could be argued that in today's relatively autonomous and free-thinking society, government can no longer rely upon issuing directions (orders) and publishing impactful messages as a means of influencing the public's behaviour, as it might have done as recently as World War II. Posters displayed in public places were designed to evoke and provoke a code of behaviour, in the face of impending security threats and diminishing resources. Communities relied upon the government to

protect, guide and instruct them, largely without questioning its strategy or methods. For most people, there was a sense of unity and a common goal.

Since then, there has been a cultural shift towards a more questioning society as information is more freely available, and the public have the confidence to form their own opinions. In addition, during the past couple of decades, electronic communication and social networking will have had a humanizing influence on us, fostering the emergence of a collective intelligence (Levy and Bonomo, 1999), and a meeting of (public) minds. Environmental behaviour will become self-shaping, as new social norms are established. On the other hand, there is a potential threat to mutual regard by sustained and rapid migration, growing diversity, which leads to a loss of trust and social co-operation (Collier, 2013). In addition, an analysis of recent field data (presented in subsequent chapters) indicates that as far as climate change is concerned, the public remain confused and mistrusting. Even if there was a common goal, a campaign to influence the public is extremely challenging and requires a more complex approach than would have been necessary some fifty years ago, or more.

By the late 1950s, government believed that Britain could be modernised by incremental change and enlightened experiments in state intervention. They were mistaken, as they had been drifting all the time toward the rapids (Addison, P. (2010)), producing powerful currents of changing social values and behaviour. As Addison points out, the British had given up most of their liberties for the duration of the war and it remained to be seen how far they would recover them when peace returned. As well as a shift from a predominantly working-class society to pre-dominantly middle-class one, Britain was subject to rising feminism, multiculturalism and a more liberal, individualist society. However, it could be that the overriding factor in the government's inability to coerce the public by similar means as were deployed during World War II, could be the erosion of British national identity.

Considering this realisation, the impact of art as actor within such a necessary and complex approach (towards a common goal), is worth revisiting and re-evaluating. The experimental methods introduced here respond to the need to further our understanding of how the public relate to life and other people, through a form of art. It could be said that the weakness of this approach is that the relationship between art and the human brain cannot be fully explained; however, this also serves as its strength. If it were not so, we might eventually exhaust its influence and render it redundant. As artist and sculptor Auguste Rodin (1840-1917) said, *"Great works of art… make us understand that there is something else that one cannot know".*

## 4.3. The Impetus

The rationale behind this research design is that a linking-up of the ideas, understanding and evidence, when applied to art and science, would produce a more effective vehicle for delivering scientific knowledge to the public, one which engages them and helps society to move closer to a more resilient and sustainable way of living within the changing environment. The methodological approach is participatory, and generally inspired and informed by the literature review, for example, Section 2 of the field research exhibition experiments with theory from Charvet (1997), modified in this case for visual communication, as opposed to verbal communication. The visual materials built for the experiment, i.e. paintings, are inherent subjects of artistic license, which adds uniqueness to the research, without limiting the scope for replication and further research, where artistic license can be exercised in a similar way. These works are not modelled on any artwork or ideas created by other authors/artists.

This field research has presented the artist/scientist researcher with an opportunity to further explore the experience of alchemy between art and science (refer to Preface). She has in effect acted as "*neurologist*", using *"techniques unique to artists"* (Zeki, 1999). Furthermore, her experience in business management and graphic design skills come into their own within the construction of the field experiment visuals and influence the analysis and interpretation of data.

But when considering how art-science can assist with the engagement of the public today, compared with say 1940's War-time Britain, a top-down approach to encouraging a sense of national unity, might not be so effective. One observation is that today's public is adaptable, familiar with constant change and a fast-moving social landscape. Therefore, the public is trained through experience to be more flexible, to learn and respond quickly, to think for itself, voice opinions and have higher expectations, and it has the technology to support it. Sympathetic to these conditions, perhaps the climate change message needs to be constantly reviewed, refreshed and re-delivered to attract any subscribers in today's fast-developing world. However, the business of justifying and convincing the public about the need to adapt in the face of climate change was not the objective of this field research.

Reference arts project evaluations reviews (Newman, *et al*., 2003; Clements, 2007), it appears that community arts projects of the past twenty years or so have lacked any robust evaluation. The question remains as to whether investment made in public arts projects is worthwhile and

specifically, can it be effective in changing behaviour. The answer to the question will likely depend on which stakeholder is responding to it. The approach within this research project is experimental and empirical. It is concerned with observing and analyzing the relationship and characteristics of engagement, the "*two-way; re-making of the world*" (Zimmer, 2003) between the artistic visual and the individual viewer, set within the context of climate change. Section 3 of the field research experiments introduces an element of mystery (Bacon, 1909-1992), the "*implications for perception"* within abstraction (Zimmer, 2003), and relational aesthetics in Section 2, 4 and 5 of the field experiment exhibition, the site of "*meaning-making*" (Lovejoy, 2009).

Inspired by medieval philosophy on rhythm and symmetry (St Augustine, AD354-430) and more modern theories and principles of artistic sketching and painting (Green, circa1880; Rankin Poore, 1977), Section 4 set out to confirm that a compositional arrangement that follows some rules will have more impact than one which ignores them, and that the more impact the visual has on the eye, the more impact it has on our rational and emotional brain, bringing about an increased motivation. The experiment outcome is discussed in Chapter 6.

Section 5 experiments with the principle of visual literacy and "*story-telling*" (Trumbo, 2000), giving us an insight into the relationship between rationality and emotions, "*drives and instincts*" (Damasio, 2006), individual realities (Shroeder, 1996), and how the public place themselves within the geographically ambiguous ((Ruddock, *et al*., 2013) scenes, and relate to who they are (Balm, 2000). Group discussions around the four paintings in Section 5 offered a glimpse of "*like-mindedness*" and the potential for a "*collective intelligence*" (Levy & Bonomo, 1999) within climate change adaptation, which is discussed in Chapter 7.

## 4.4. Positionality

The author spent many years working in the commercial environment and business management before changing direction to study for a degree in Coastal and Marine Environment Studies. Her environmental science interests, together with artistic skills led her to explore the role of art in engaging people in the environment, and she has had several successful exhibitions in public spaces, in collaboration with the National Assembly for Wales, Pembrokeshire Coast National Park Authority, and RSPB Cymru. Her underwater oil paintings have typically sold to marine ecologist divers and those involved in environmental work. This

personal interest in the relationship between visual art and environmental science led Rhian to this PhD research project which is sponsored by the AHRC Doctoral Awards Programme.

Her influence within the design of the methodology for field research is profound and pronounced, having deep-set foundations of professional artistic application and experience. Despite efforts to be objective and unbiased in her approach, it has proved difficult on several occasions, especially where research has required original artwork. However, these difficulties are reflected upon within the discussion. Apart from this, the author is ideally positioned to explore art-science, having a keen interest in both art and science, plus first-hand experience of what she would claim is a "*symbiotic*" relationship.

Being sympathetic to aesthetic power and how artistic rendering must get to the heart of the issue (Leavy, 2015), the imperative to design and build the test-kit of visuals which would stimulate participation and useful data, was upon the artist researcher from the onset. As Leavy (2015) suggests, while arts-based researchers come from a range of disciplines, attention must be paid to the artistic craft one is borrowing from. In the case of this project, the researcher lent an accomplished hand, with the rigor that can achieve Leavy's (2015) "*deep aesthetic impact*" through her "*unique quality, vision, approach, talent or perspective*". In other words, the artist-researcher necessarily brought herself to the project, with her own fingerprint and signature.

With awareness of this, the artist's identity, (the researcher conducting the field activities), was not revealed to participants until the exercises were completed. The aim was to encourage free expression of ideas and opinions and an uninformed, subjective response to the questions, avoiding any possible bias (positively or negatively) and potentially a more conscious, objective response, which might result from participants knowing they are in the presence of the artist.

## 4.5. Location and participants:

*Strategy*

One of the main concerns at the outset was the need for an adequate volume of responses and data, to respond to the research questions, and contribute knowledge to the field. The main

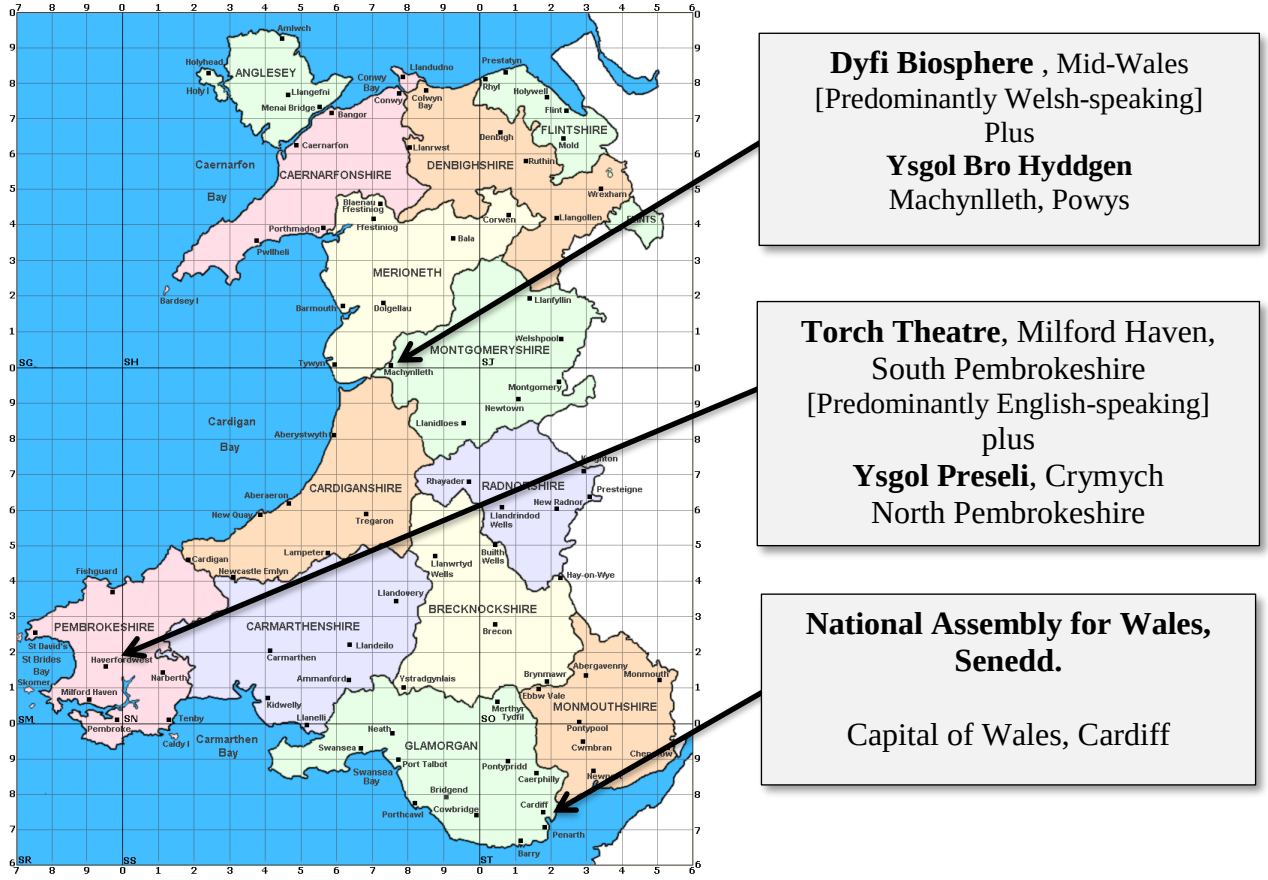
method deployed was to be experimental and therefore without a track-record or model. To this end, it was decided to optimise the data collection opportunities by spreading the potential risk (of failing to attract sufficient participation and useful responses) across Wales and several types of collection points, illustrated in Fig.4.1. The Dyfi biosphere was already designated as an area for focus within the original AHRC project proposal, and two additional locations were chosen, not only as back-up, but also for comparison, if deemed to be useful within the analysis and interpretation process.

In considering the challenges of attracting the public to participate in field research activities, the researcher was of the opinion, informed by her experience within market research and business promotion campaigns, that the selected locations would need to be spaces which already attracted the public on a regular basis, in other words, a captive audience. Although other options were also considered, such as village community halls with exhibition facilities, the likely success rate of attracting participation in numbers by volunteering local public was judged as limited and unreliable (hit-and-miss), therefore risky and low. An additional concern was that in specifically inviting the community to participate in an event advertised as art, science and climate change, attending participants would be inclined to already have an interest in art and the environment, usually of higher social classes (Newman, *et al*., 2003) and better educated, whereas the research was aimed at attracting public from a wider demographic, and being accessible to all. In view of this, a location which already had a foot-fall was deemed preferable.

Besides attracting sufficient numbers of adult public participants, it was also important to the researcher that the perceptions, attitudes, understanding as well as opinions and ideas of our younger population were sought. This generation will come to witness an increasing severity in climate change impacts globally as they develop into adults and have families of their own. Furthermore, it was hoped that their young minds would engage with the research activities and contribute innovatively to the project. One might assume that they have a good understanding of global warming and climate change, having been introduced to the subjects within the educational environment and via electronic media. However, the way in which students relate to climate change impacts within their everyday lives and local communities, their perceptions of cause (and blame), sense of efficacy and the ideas they contribute towards mitigation and adaptation, remained areas for exploration. To this end, two secondary schools were identified for field research activities. The experimental use of art within the classroom

provided insights and stimulated debate within the classroom, which provided useful qualitative data.

Fig.4.1. Field Research Locations: Map of Wales
© http://www.swvp.ca/mapslit.html 2014

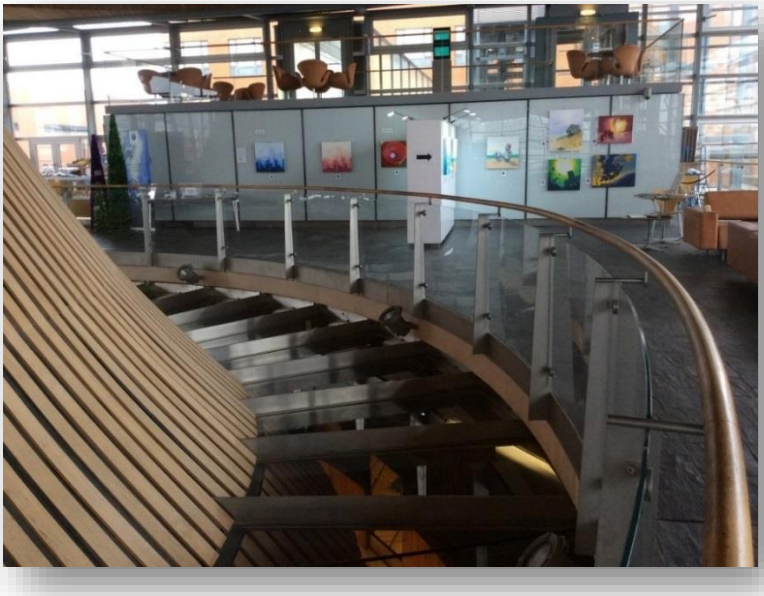



*Cardiff*

Targeting the National Assembly for Wales, Senedd, the main centre for democracy and devolution in Wales, Cardiff, as accommodation for the research, was part of a strategy which was believed to offer additional potential as a project profile-raiser, and placed it within the Welsh policy and politics environment, helping to underpin its context of public engagement and climate change adaptation. The Senedd attracts visitors daily (individuals and groups on tours), and has the added benefit of a café situated adjacent to the exhibition areas, which encouraged visitors to spend more time within the space. Furthermore, this location satisfied a personal goal motivated by the researcher's Welsh national identity. As a practising artist, Rhian had exhibited her artworks three times in previous years within the National Assembly for Wales headquarters, including an exhibition in collaboration with RSPB Cymru. Having

experience of the application process and contacts within the accommodation department, meant that this research activity was confirmed and diarised early in the field research planning stage. In accordance with their procedures, the exhibition was sponsored by an Assembly Member, Mr. Paul Davies (Pembrokeshire), and was active for a period of two weeks in December 2014. The following photograph (Fig.4.2.) shows the layout of the exhibition, the café to the left, and a section of the Debating Chamber public observing gallery in the foreground.

Fig.4.2. Field research experimental exhibition at the National Assembly for Wales, Senedd public area, Cardiff, 2014.



*Pembrokeshire*

Pembrokeshire is the researcher's home county and its culture is influenced by English-speaking incomers from around the UK, mainly England, especially in the past few decades. There are relatively few Welsh speakers residing in the south of the county compared with the north, and other neighbouring Welsh counties, which contrasts with the Dyfi Biosphere area, which is predominantly Welsh-speaking. The Torch Theatre in Milford Haven, South Pembrokeshire, was identified as a suitable venue for the research exhibition, mainly from an easy access point of view, but also because the researcher had experience of successful exhibitions previously, had built a relationship with the arts director and had a feel for the flow of visitors that the site tended to attract. South Pembrokeshire is predominantly English speaking and Milford Haven is home to a diverse social class demographic. The Milford Haven

Waterway is one of the deepest natural harbours in the world. It is the largest UK energy port and supports leisure and tourism, fishing, food processing and aquaculture industries. The Torch Theatre is Pembrokeshire's only professional theatre venue and arts complex, funded principally by the Arts Council of Wales and Pembrokeshire County Council. It offers a mix of arts entertainment including Cinema, Theatre, Bar, Cafe and an art Gallery, and has been in existence since 1977. The field research exhibition was accommodated within the gallery area adjacent to the café where visitors would often spend time before and after arts performances, for a duration of four weeks in June 2015.

Several days were also spent at the Welsh medium school - Ysgol Preseli, Crymych in North Pembrokeshire, conducting field research with under 18-year-old students from various classes and abilities. Teaching staff co-ordinated a diverse range of ages and abilities, from 11-year olds to 18 year olds to take part in the research. The availability of the different classes was subject to the school's schedule and commitments on the day. The research took place within one day in July 2015. Each session with students involved a questionnaire and drawing task, the "*Pick-A-Card*" exercise and group discussions around a set of four paintings, and was supervised by a member of the teaching staff.

*Dyfi biosphere, Mid-Wales.*

The original project proposal funded by AHRC CDA focussed on the community of the Dyfi Biosphere as its case study. This area is an UNESCO-designated biosphere region in Mid Wales, centred on the Dyfi river and estuary and including parts of the Snowdonia National Park, Cambrian Mountains and Cors Fochno peat bog nature reserve, as well as towns and villages including Machynlleth and Aberystwyth. The Dyfi Biosphere partnership aims to protect and promote understanding of the unique natural environment of the area, and to engage local communities in sustainable development. The partnership involves a wide range of stakeholders, including both scientists and local artists, and art is recognized as a key medium for communicating scientific understanding and engaging local communities in the work of the biosphere.

To investigate local public perceptions and attitudes to their environment and the role of art within it, field research was conducted within the region including interviews, and questionnaires. Efforts to involve the local community on foot and in local businesses and organisations failed to generate particularly useful responses, as did investigations into identifying suitable venues in which to conduct experimental research using the test-kit of paintings which required exhibition facilities. The arts network was inactive and artists difficult to locate within the time available. For these

reasons an online questionnaire was set-up and the local community were invited to participate. This method proved effective and enabled the collection of many thoughtful and interesting qualitative responses. To capture data from under 18-year-old participants, a similar programme of research activities like those conducted at Ysgol Preseli, Pembrokeshire was repeated with students of varying ages and abilities at the secondary school - Ysgol Bro Hyddgen, in Machynlleth.

*Participants*

To test any hypothesis that suggests that art has a role in engaging and influencing the public, within a science context, the research needed to reach out to capture the perceptions, beliefs and attitudes of the public who might not normally engage with art and with science or the environment, as well as those who would (e.g. wildlife enthusiasts, art collectors, artists, eco-tourists, environmental NGO members etc.). No one was excluded from participating, however, attracting a public with diverse interests and priorities was difficult due to time and cost restraints, as well as the location and availability of suitable venues. The project was successful, however, in gathering data from a wide age range.

The age-range of participants was between eleven and eighty (plus), including secondary school pupils who have relatively informed opinions and experiences of art, science and environmental issues, and are in some cases studying the subject as part of the school curriculum. It was considered important to include all ages upwards from secondary school level, to members of the adult public progressing through different stages in life, with different maturity, perspectives, beliefs, ambitions and life-priorities. Ethnicity, language and occupation was recorded within the questionnaire/interview.

Participation was self-selecting within the three locations (specified below). The total number of participations exceeded eight hundred (n=800) across the methods with some respondents participating in several exercises. Individual participants' responses have been allocated a serial number and can be tracked. This is particularly useful for matching participant drawings with for example, their demographic profile. All data from the questionnaires and field experiments is logged in spreadsheet format.

With the aim of collecting as much data as possible within the time constraints, whilst acknowledging that the field research was largely experimental, the strategy was to cast the net

wide and deep. To help achieve this, the number of research sites was tripled, enabling some trialing and modification as necessary between one site and the next. With the participants being self-selecting there was little control over demographics, especially age, gender, social class) except where the under 18-year-olds in schools were concerned. Overall, the research exercises generated a relatively large volume of data, which provided a convincing and encouraging response to the research questions (Chapters 6 & 7).

## 4.7. Design

Participatory research (more commonly known as participatory action research (PAR)) seeks to democratize research design by studying an issue or phenomenon with the full engagement of those affected by it. It involves working collaboratively to develop a research agenda, collect date, engage in critical analysis, and design actions to improve people's lives or effect social change. PAR is not a specific methodology with exact procedures, nor is it thought to be about data collection alone. Therefore, participatory research often relies on less formal data collection methods and seeks to foster a community's capacity to problem solve and design actions without having to rely solely on outside experts. Active participatory research that builds on personal observation and feeling can open many new avenues of inquiry and understanding. In addition to producing information, it is believed that PAR data-collection methods should draw on the experiences, and nourish the critical and creative capacities of all participants (Clifford, *et al.*, 2010).

The key difference between participatory and conventional methodologies lies in the location of power in the research process. Institutions have become particularly interested in participatory methodologies for health research. Most participatory research focuses on knowledge for action, with an emphasis on a bottom-up approach and locally defined priorities and local perspectives. The key elements lie in the attitudes of researchers, which determine how, by and for whom research is conceptualized and conducted. It is characterized as being reflexive (Leavy, 2015), flexible and iterative (Cornwall and Jewkes, 1995). Experiments in India in the late 1980s with mental maps led to innovation by illiterate villagers. This example (Cornwall and Leakes, 1995) shows how confidence can be restored and people can be empowered to engage in a process that helps them confront their problems. This can extend their communication beyond the verbal.

Although this project offers opportunity for participation, the process at this stage lies outside their ultimate control, including the analysis and interpretation of outcomes. However, both the participant drawings exercise and the test-kit of paintings do call for the public to visualize and represent their perspectives in their own terms. There is perhaps scope for the public to organize, to implement potential solutions and act, as a follow-on from their experience as participants in this type of research project. The potential for the public to collect and share their perspectives, towards influencing a shift in behaviour, within the context of climate change adaptation, is discussed in Chapter 7.

A potential downside to participatory research such as this is that is can shift attitudes and create unease towards controlling bodies (e.g. governments) that exercise powers over them and lead to a backlash. This could be most dangerous in developing countries where there is a vast imbalance in power between the public and government, and corruption is rife, e.g. Africa. Attention to the ethical concerns within PAR is pertinent in such circumstances (Leavy, 2015).

As Cornwall and Jewkes (1995) suggest, the process of constructing a visual representation (and perhaps interpreting an existing visual), reveals issues and connections that local people may not have previously thought about. In contrast with conventional methodologies, PAR is understood as more of an attitude or approach than a series of techniques (Cornwall and Jewkes, 1985).

The Participant Drawings exercise within this field research satisfies this particular criteria well. Although participants were not at any stage involved with the design of the field research methodology, they contributed ideas for effective ways of making a visual impact, which might help engage the public in climate change adaptation. Throughout the field research, where appropriate, an open and subjective response to all images within the experiment and group discussions was encouraged, within the subtly guiding prompts and questions that accompanied them. It could be said that further participation would be valuable within the data interpretation stage of the project, whereas in this case it has been carried out by the researcher

Faced with a spectrum of uncertainties at the outset and aware of the potential complexity of the research field, it was decided to cast a wide net, and maximize the opportunity to contribute new knowledge by adopting a mixed method approach which would be executed in several locations. Recognising it as an ambitious starting place, a multidisciplinary perspective seemed

necessary, and so conventional, as well as experimental methods were developed, which would generate a broad range of quantitative and qualitative empirical data, as follows:

**Field experiment** - using a test-kit of paintings with questions in five sections. The field experiment explored how the public respond to artistic representations of environmental scenarios, in five sections, using a set of related questions.

**Questionnaires** – both hard-copy and online. The questionnaires also helped facilitate the collection of drawings by the public which represented how they believed climate change is best symbolised visually. The complete collection of drawings by the public, including school pupils is available to view in the Appendix - numbers 7 and 8.

**Interviews and group discussions** – key persons, plus under eighteen-year-old school pupils. The group discussions were designed to encourage open dialogue and the sharing of ideas in response to a set of four paintings depicting scenes which could be interpreted as relating to climate change impacts (but not necessarily). The interviews and questionnaires provided some basic demographic data plus data relating to attitudes to art, science, climate change and lifestyle as well as how families managed responsibility for domestic decisions.

**Climate change image poll "*pick a card*".** The climate change image poll was a quick-access engagement exercise for the public, particularly useful where time was limited, as an interim exercise or for passers-by who were reluctant to get involved in the more comprehensive exercises.

The quantitative and qualitative data collected throughout the field research was entered onto a spreadsheet and trends noted for discussion in Chapters 6 and 7. Following a study of methods for analysing images (discussed in 4.8) participant drawings collected via questionnaires were analysed using the simple method of categorising the themes used for adults and under eighteen year-olds seperately and presenting them in chart form. These are discussed in Chapters 6 and 7, and provide an insight into public perception of global warming and climate change threats, as well as causes.

In addition to data collection via field research, a desk study of visual art created during human crisis was carried out, exploring art of extreme weather events between the years 1400 and 2000, World War II posters and more recent climate change images, discussed in Chapter 5.

The aim of this study was to observe and consider visual art's role in times of duress and identify potential for its application within current and future human threats to survival.

### 4.7.1. Field Experiment

Figure 4.3. provides a visual document of the process of planning and designing the field experiment. The test-kit consisted of twelve oil paintings relating to five separate experiments, was produced at the workshop studio in the Preseli Mountains, Pembrokeshire, West Wales.

Fig.4.3. Planning work in progress at the art studio, 2014.


*Overview*

The motivation (as artist-scientist) for carrying out this experiment was curiosity and a drive to test some long held beliefs relating to how the public interact with art and how that can be influenced, especially by the artist. This study would provide insights into the impact of visuals, in this case unique and original artwork, and not public perceptions and attitudes to climate

change, even though this was the context within which the experiment was placed. It would provide an opportunity to monitor and evaluate the ways in which art affects, and is consumed by the public.

The experiment was designed to encourage subjective participation, and required a written response to a set of images. Although the participants were self-selecting, the methods were designed to encourage the public to contribute, and not just the higher classes and art enthusiasts/environmentalists. The sample is not representative of the population; however, the experiments were conducted within three areas of Wales – Cardiff, Pembrokeshire and the Dyfi biosphere, and included the public between the ages of 11yrs and 88yrs. The total participation number across all methods was 895 of which 83 were participants in the five-section field experiment.

Similar studies have been carried out throughout the last decade or so, in relation to the use of visuals (Trumbo, 2000; Healey & Inns, 2002; Bamford, 2003; Docherty, *et al*. 2004; Nicholson-Cole, 2005; Sheppard, 2005; Yarwood, 2005; O'Neill & Nicholson-Cole, 2009; O'Neill, *et al*. 2012; O'Neill, 2013). O'Neill & Nicholson-Cole's (2009) study using Q-Method and their reference to "VisionS" (carried out between 2000 and 2004 in the UK, measuring saliency and efficacy), has similar features. O'Neill & Nicholson-Cole's (2009) methods allow people to freely articulate their personal interpretations of climate change. It also involves exposure to sets of climate change images which were selected for their content and range of climate change impacts.

For this experiment, in contrast to previous studies, attention was paid to ensuring that the test-kit of paintings could not be easily substituted with photographic images, to contrast with other recent visual analysis research. Figure 4.3. illustrates preparation for the experiment, which took place at the author's art studio in Pembrokeshire. It hoped to explore the potentially unique qualities of art, and the role of the artist (Zeki, 1999, 2012; Zimmer, 2003; Ramachandran & Hirstein, 1999), within public engagement management.

*Aims*

The aims of the field experiment were:

- To observe how the public engage with original visual art
- To understand the role of art in engaging the public in climate change

- To explore individuality and its potential for climate change engagement
- To identify the unique contribution that art brings to science communication and public engagement

The purpose of this experiment was not to change or infuence behaviour, but to explore how the public are influenced. One consideration in constructing these paintings, was that they should be easily distinguishable from photographic images, and therefore different from visuals used in previous studies. This approach also served to highlight the uniqueness of art and contribution by the artist. Methodology for each of the five sections in the experiment are explained below. As an introduction to the tasks, participants were asked to provide information regarding their occupation, age-range and gender, in case this data were considered to be useful to the analysis.

*Distinct Sections*

The experiment consisted of five stages or tasks:

1. **Emotional Connection** – comparing response to warm and cool colours within a context of global warming.

2. **Motivational Response** – comparing decision-making between individuals using two contrasting scenes.

3. **Accessibility** – comparing abstract and representational styles; with and without title and narrative.

4. **Engagement** – testing the impact of proportion and balance (strength of composition) with two paintings of the same content but arranged differently.

5. **Perception** – recording how individuals interpret and relate emotionally to a set of painted scenes which might be perceived as relating to climate change impacts.

*Emotional Connection*

Whilst we traditionally accept that reds are warm colours and blues are cool colours, it is interesting to note that the colour temperature (that is measured in degrees Kelvin) is higher for blues than it is for reds. Studies carried out which examine the relationship between lighting

and work performance[21] (Mills *et al*., 2007) show that light quality can affect workers' moods and production in the workplace. However, for this experiment we refer to reds as warm and blues as cool.

This task aimed to compare the emotions of participants when considering global warming whilst viewing two paintings of the same subject (Fig.4.4.), one depicted in warm colours (pinks) and the other in cool colours (blues). The design of the experiment allowed for the testing of the hypothesis that individuals would react differently to thoughts of global warming in response to the two palettes of colour, simultaneously.

It was anticipated that most people would be either repelled or attracted by a colour, or put another way, have a positive or negative experience of the different colours, and that this has potential to affect behaviour, in this case their motivation to act within the need for climate change adaptation.

Fig.4.4. Reaction to global warming in response to contrasting colour stimuli.


[21] The effects of lighting (in terms of colour temperature) on the human circadian system are well-established (Mills *et al*., 2007).

Participants viewed both paintings, which were displayed side by side, and responded to the questions below in Figure 4.5.

Fig.4.5. Questions for Section 1 of the Field Experiment.

Which painting do you feel most attracted to? A or B

Thinking about global warming, which of the listed emotions best describe how each painting makes you feel?

| | | A | B |
|---|---|---|---|
| 1 | Hopeful / optimistic | | |
| 2 | Positive / passionate | | |
| 3 | Calm / reassured | | |
| 4 | Scared / anxious | | |
| 5 | Annoyed / frustrated | | |
| 6 | Helpless / confused | | |
| 7 | Nothing (no feelings) | | |
| 8 | Other: _____ | | |

*Motivational Response*

The theoretical framework underpinning this section has been influenced by the literature reviewed within Chapter 3: Art and Human Behaviour studies concerned with personality and motivational traits (Charvet, 1997).

Before commencing with this task, participants were asked to complete a section which asked how they perceived themselves, especially in a social environment. The purpose of this was to help determine personality type and build a motivational trait profile which could be compared with their responses in the task, to test the hypothesis. Before commencing with stage 1. of the experiment, participants were asked to answer the following questions:

Q. Which of the two statements from each set below (Fig.4.6.) describes you best? Tick (a) OR (b) in each set**.**

Fig.4.6. Personality questions for Section 2 of the Field Experiment.

| | | |
|---|---|---|
| 1. | (a) | I always pay attention to the detail, first… OR |
| | (b) | I like to see the big picture first. |
| 2. | (a) | I like to avoid problems and getting 'caught out'… OR |
| | (b) | I like to try new things and take risks sometimes. |
| 3. | (a) | I prefer to fit in with everyone and be 'normal'… OR |
| | (b) | I am happy to stand alone sometimes and rebel. |
| 4. | (a) | I am happy to work things out for myself… OR |
| | (b) | I prefer to check with the experts before going ahead. |
| 5. | (a) | I like to get on with the job, regardless of others… OR |
| | (b) | I am happy to do my bit once I've assessed the situation. |

The choices offered participants (above) aim to indicate their behaviour traits, classified as follows. Note that the participants were not privy to the classification information underpinning this exercise.

- **Toward / Away from** – What will trigger the person into action – a threat or an objective? [1.(b) / 1.(a); 2.(a) / 2.(b)]
- **Internal / External** – Does the person find motivation in external sources or internal standards and beliefs? [3.(b) / 3.(a); 4.(a) / 4.(b)]
- **Reactive / Proactive** – Does the person take the initiative or wait for others? [5.(b) / 5.(a)]

This section of the experiment aimed to establish how an individual relates themselves to the visual through motivational traits (Charvet, 1997) when two different images are presented at once. The participant is encouraged to engage with the images (Fig.4.7.) through a series of questions and asked to imagine themselves as part of one of the scenes depicted (but interpreted solely by the participant throughout the experiment). Charvet's (1997) motivation traits draw upon the Language and Behaviour Profile (LAB) created by Roger Bailey in the mid-1970's. The choices they make could indicate their motivational traits as described by Charvet (1997), for example, different personality types were anticipated to respond as follows:

*Motivational trait*

a) **Away from** traits would choose painting A (for reasons outlined in artist's description below).
**Toward** traits would choose painting B (for reasons outlined in artist's description below).

b) **External** types would indicate there *is* a leader;
**Internal** types are less likely to identify or need to believe there is a leader.

c) **Proactive** types were more likely to place themselves at the front of the scene, while **Reactive** types were more likely to avoid the front, at least at this stage.

The paintings are designed to convey an array of conditions such as danger, hope, escape, discovery, vulnerability, a sense of responsibility, community etc. They both depict families with children, although they are dressed in such a way as to play-down individuality and to make them relatively anonymous. The artist's perspective for these paintings (not provided for participants) was that A = threat of loss; B = promise of gain:

Fig.4.7. Visuals used for Section 2: Motivational Response

Red for heat, fire, danger, pain, tunnel shape. Could represent fleeing, exodus, escape, exile, survival, disaster, each person to his own, safety, protection, secrecy

Yellows, greens, strong central icon, light! Could represent reaching, arriving, aiming, discovery, pilgrimage, community, support, sharing, salvation, redemption, healing, relief.

Instructions for participants:

Look at these two paintings A and B and try to observe how they make you feel, for example –ask yourself "*which one am I most attracted to and why*?" Then try to answer the following questions (Fig.4.8.). Remember, there is no right or wrong answer.

Fig.4.8. Questions for Section 2 of the Field Experiment.

Which painting makes you feel like 'joining' in most? A or B

a) Do you believe there is a leader in A and/or B

b) Having decided if there is a leader in either of the paintings, does that change how you might feel about joining in? YES, NO, or Not sure

c) If you joined the people in these paintings, where would you put yourself in relation to the others?

| **A** | 1 | Behind them | **B** | 1 | Behind them | **OR** | I wouldn't join them at all |
|---|---|---|---|---|---|---|---|
| | 2 | Amongst them | | 2 | Amongst them | | because…… |
| | 3 | In front of them | | 3 | In front of them | | …… |

The aim for this experiment was to explore how different personality types might relate to contrasting visual information.

**Accessibility**

How easily we access art could make a difference to the way we engage with it, and an image which is abstract in style might be more difficult to engage with than a more representational one (Fig.4.9.), where the subject matter or narrative is more obvious to the viewer. Zimmer (2003) "*on Exactitude and Science – abstraction and how exact sciences must be built on inexact representations…"*, suggests that impressive works do not necessarily help us to achieve our ultimate goals. One suggestion is that artwork trains the viewer and teaches him or her to see the world afresh (Gombrich, 1960). After all, artists are neurologists; we respond differently to abstract images (Zeki, 1999). Recently it has been suggested that the viewer "*completes*" the painting (Kandel, 2016).

Fig. 4.9. Visuals for Section 3: Accessibility.

**A**. Abstract

**B**. Representational

**Title:** "*Polar bears are not going to be all white"*

**Annotation (narrative):**

> Polar Bears' habitats are melting, brought on by damage to the ozone layer and global warming. This painting accentuates the precarious situation that Polar Bears find themselves in, and their usual 'snow-white' fur coats are depicted as red, reminding us that they are in danger and they are precious life-forms with blood in their veins.

**Stage 1**: Abstract painting A, was shown to participants first, with no title and no accompanying explanation or annotation. Participants described what this painting represented/meant to them.

**Stage 2**: Participants were then able to view the second more representational painting B with no title. They described what this painting represented/meant to them.

**Stage 3**: Participants were given the title and annotation and the following question was asked, with the aim of discovering how the participant's engagement with the topic altered through the process:

The main aim with this section was to explore whether people access the image and its message, or engage to a greater extent with it, when it is more obvious, or is spelt-out/explained.

Participants chose from a list of emotions (Fig.4.10.), or articulated their own emotional experience of the experimental process.

Fig.4.10. Questions for Section 3 of the Field Experiment.

Q. Having read the title of this painting, how do you feel about the painting?

1 I preferred not knowing the title.
2 The title has confused me.
3 The title has helped me to understand and enjoy it.
4 The title hasn't made any difference to me.
5 Other: …….

Q. Having read the information about the painting, how do you feel?

1 More interested
2 Bored
3 Confused
4 Upset
5 Shocked
6 Pleased
7 Nothing / not sure
8 Other……

**Engagement**

If it is true that great works of art resist destruction (Ogden, 1938) and that there are rules in art that set one work apart from another in terms of quality and impact, then what makes one painting great? This task applied rules of composition in terms of proportion and balance to see whether people engage better and gain more satisfaction with art that complies, compared with art that denies, or defies the rules. The experiment applied principles of balance and proportion (Green, circa 1800) or rhythm and symmetry (I.E.P. 2010) and focused on the visual impact, NOT the subject matter. It also related to a debate around what is good and bad art. Participants responded to the question of what is good and bad art within the stand-alone questionnaires.

Participants were shown the two images (a) and (b) (Fig.4.11.) and asked to choose which one they felt strongest about / are drawn to / struck by/ most confident or happiest about.

Fig.4.11. Visuals for Section 4: Engagement

A

B

A factor to consider with this experiment is that within aesthetics, people often prefer the first thing they see and choose that over a change to something different, for example, landscapes and windfarms (Townsend & Shu, 2010). While many studies have shown that exposure frequency affects consumer attitudes and preferences, there is evidence that the order of exposure does so also. Three studies show that people like the initial stimuli better than similar stimuli encountered later. Controlling for exposure frequency and duration, individuals prefer the version of a song they heard first to a version they heard later and images they saw first to mirror images they saw later. We often hear people comment that the book they have read previously to viewing a film production of the same story was more satisfying. Additionally, results suggest that perceived originality contributes to the preference for a first encountered stimulus, and discussed in relation to research on order effects in sequential rating formats.

To this end, it was decided that participants would be exposed to both paintings simultaneously, with the stronger of the two paintings (which follows the rules of a stronger composition drawing instruction) displayed second in a row, left to right, in accordance with the flow and order of the exhibition and experiment. However, the order of display was swapped during the experiment as a control, and a note of the point of swapping kept accordingly for reference during data analysis.

**Perception**

Fig.4.12. illustrates how the exhibition was arranged so that participants could start at one end and follow the sections from 1 – 5 along the wall. Participants were instructed to view five sections of images in sequence and answer specific questions relating to each image.

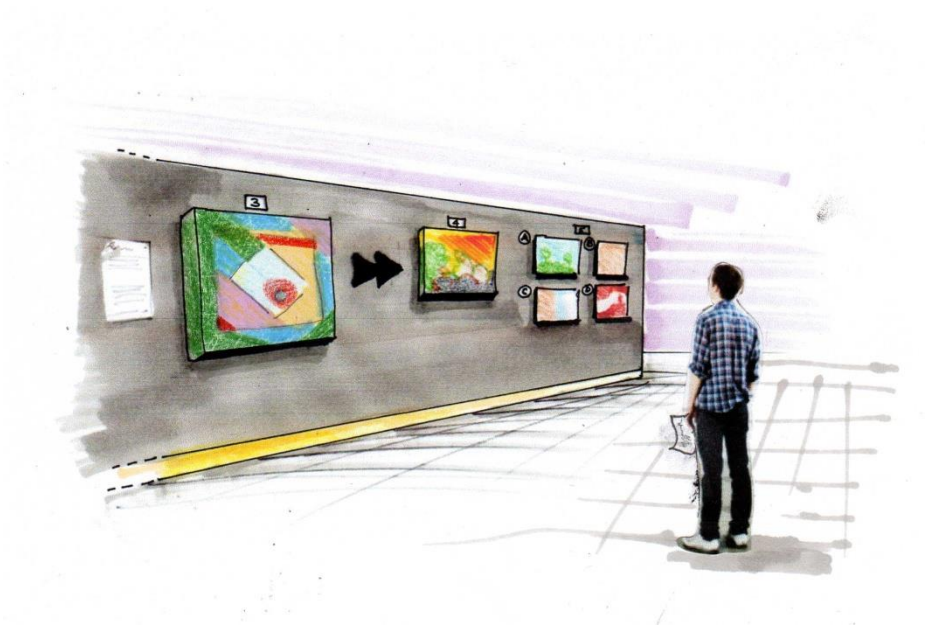



Fig.4.12. Diagram to illustrate arrangement of experiment - Rhian Field 2014

Connective with ideas of biological function (Ramachandran, 1999), man's "*limits of flexibility*" and environmental stress (Reynolds, 1980; Shroeder, 1996), as well as emotional management which calls upon emotional intelligence (Salovey, 2005), a set of four oil paintings was designed and constructed for Section 5, to act as emotional stimuli for both personal experience and the ability to empathise. Each of these four scenarios were anticipated to be perceived as either local and immediate, or distant and futuristic.

This experiment involved four paintings displayed as a group as in Figure 4.13. Each one tells a story that could relate to climate change, such as erosion, fire, pollution/energy and flood. Participants gave a brief interpretation, described the feeling evoked for each painting and answered further questions designed to give an indication of how they related the scenario with themselves, and their immediate situation and other people in the wider world. The layout of this section of the questionnaire is shown in Figure 4.14. Following this, participants gave an indication of how adaptable they were to impacts of climate change. Participants interpreted

the four paintings subjectively, without any cues from the researcher, thus providing qualitative data. A summary of the most commonly used interpretations and feelings expressed within the experiment is included in the results.

Fig.4.13. Four visuals for Section 5: Perception

A

B

C

D

Fig.4.14. Questions for Section 5 of the Field Experiment.

Q. State briefly what you believe each painting is about and how it makes you feel?

A …… "I feel……"

B …… "I feel……"

C …… "I feel……"

D …… "I feel……"

Q. Which is the LEAST desirable scenario in your opinion?

1 For other people around the world (a),(b), (c ) or (d)

2 For you and your family (a),(b), (c ) or (d)

Q. Do you believe you would be able to adapt to climate change?

I could adapt EASILY I could adapt with some HELP

I would find it DIFFICULT I don't believe I will need to adapt.

In the final section, Figure 4.15, participants were asked for their ideas regarding climate change, adapting their lifestyles and were invited to make a drawing in a small box which represented climate change impacts,

Fig.4.15. Drawing task from Questionnaire and Field Experiment.

FINALLY, what do you think needs to happen or change, so that people could understand what climate change is going to mean to their lives, and how they might need to adapt their lifestyles?

……..

What sort of picture would you choose to mean 'climate change'?

Draw below: Describe below:

……..

……..

……..

……..

Participants were also invited to complete the stand-alone questionnaire in addition to the experiment. The experiment was arranged to have a starting point and images were viewed in series from Stage 1 through to Stage 5, moving from left to right. Participants were given a question sheet, clip board and pen at the start, and asked to complete the questions for all five sections. In the absence of the research support team, the question sheets and necessary equipment was laid out on a table adjacent to the exhibition, and appropriate signage displayed to encourage and instruct the public who might be interested in participating. The public were advised that the task from start to finish would take approximately 15 minutes.

*Summary*

Overall, this approach worked well. The public were attracted to participate and seemed to work through the sections and questions with ease. The average time taken to complete the tasks was fifteen minutes, although some participants took extra time over Section 5. Occasionally, the task was posted into the collection box incomplete, but it appeared that mostly this was because the participant ran out of time, for personal reasons. Although the field experiment was set up in such a way as to be self-explanatory, the researcher was present for approximately fifty percent of the time, and available to encourage participation as well as assist, although this was rarely needed. Additionally, their willingness to draw their own representation of climate change in the final stage was encouraging.

### 4.7.2. Questionnaires

The comprehensive questionnaire was designed to be a stand-alone method of collecting data, independent of interviews and field experiments. Individuals and organisations were invited to participate in the completion of the questionnaire and were accessed in hard-copy, or accessed online (especially within the Dyfi biosphere area), and in some cases by post. A modified, shortened version of the questionnaire was made for use with under eighteen-year-olds, in schools. The questionnaire explored several topics divided into six sections:

1. Demographic information e.g. Occupation, age-range, language and gender.
2. Science - interest in / experience of / attitude towards.
3. Art – interest in / experience of / attitude towards.
4. The environment – connection with / lifestyle/perceptions of climate change.

5. Home decision-making and personality – how decisions are made in the home.
6. Conviction for art and science in general; climate change impacts drawing exercise.

This questionnaire was designed to gather a wide range of information which could have a bearing on the public response to art within science, in the environment, and help explore what influences behaviour. Although it is a relatively comprehensive questionnaire, some compromise was necessary in terms of the depth of questioning in some sections. However, the response gathered by this method produced key contributions towards future research. The semi-structured informal interviews drew on some of the questions from the questionnaire. Although a representative sample of the population would have been desirable, participation was self-selecting and most likely shaped by location and time of day.

There are six sections, each with its own focus, but structured in such a way as to attempt to minimise the influence that one section might have on the responses to the subsequent section. For example, section 4 was an opportunity for participants to reflect on how in-touch they felt generally with the natural environment. The questionnaire was organised so that this reflection comes before more factual questions about their environmentally-friendly habits, which was followed by questions about how they perceive climate change impacts. The rationale was that if the questions had been asked in the reverse order, it might have influenced the response to how environmentally friendly they are and their reflection on how in-touch they feel they are with their natural environment. Overall, it was hoped that the responses would provide an insight into people's perceptions and daily lifestyle habits.

**1. Demographic information e.g. Occupation, age-range, language and gender.**

This section asks for information on occupation, whether the participant is a local resident or a visitor, their first and second spoken language and their age, within a specified range. It was considered useful to this project to know whether someone is directly involved in the fields of science or art, and compare the lifestyles and perceptions of people within their own home environment with those of people living outside the area. Also, someone working mostly indoors might have a different perspective on the environment than someone who predominantly works outdoors. Language could have an influence on behaviour, depending on the culture that has evolved around it. A community of Welsh-speakers for example might behave differently to a more culturally diverse one. The age-range could be an influencing

factor when it comes to life-priorities as different stages of life introduce different pressures, priorities and commitments as well as aspirations, which can all affect decision-making and behaviour. Participants in the youngest age-brackets might be mainly influenced by what they are told and taught (although they could also have unencumbered perceptions and original ideas), whereas participants who are in the oldest age-bracket are likely to be influenced by life-experience and events of history, therefore bringing evidence and wisdom to the research. Gender is also recorded in this section for future reference if needed.

**2. Science - interest in / experience of / attitude towards.**

This section was designed to gauge the public's experience and connection with science, in relation to their lives. Asking people how relevant science is in their daily lives could provide an insight into perception of science and to what extent they value and relate to it. Asking them about how they interact with science, such as through reading, watching talking etc. was believed to give an indication not only of the level of their engagement with the subject, but also in what circumstances they access it. This section was positioned several sections before the question of how to divide an investment of £5,000 between science and art projects in section 6, to avoid influencing the decision.

**3. Art – interest in / experience of / attitude towards.**

Parts of this section invited subjective, qualitative responses and other parts asked for more factual, quantitative information. For example, "*what is art for you*?" is an open-ended question with no right or wrong answer, i.e. it invites a subjective response. It was an opportunity for us to share the public's personal ideas about art. Most of us have an idea in our minds about what art is, even on a more unconscious level. It is the less-considered, intuitive and prejudiced idea of art which is desired for this study, and not a conformist, learned answer. However, in the process of stating what good art is, an individual is to some extent making a personal and conscious choice as to what it is. The response is valid either way, because we were not seeking the truth but only an opinion. In asking participants to score between 0 and 10, we have an indication of their commitment towards art, the awareness they have in terms of the role that art plays in their life, and their attitude towards art in general.

Asking for an opinion on the difference between art and photography is helpful in defining what is unique about each one, and how differently they might be consumed. Fine art photography could be contrasted with other types of visual art, such as painting, drawing and

print-making. Responses to this section could help to answer this question of whether art-science collaboration in the context of climate change adaptation should include photography.

Participants were asked if they have attended community-based art events, as it is likely that their responses would be informed by their experience of them. It is an opportunity to ask further questions about the value of such events, and asking respondents to score the importance of art in their lives gives a clear indication of their *attitude* to it, but not necessarily its influence on them (as that could be largely an unconscious one, for many people, or at least very difficult to articulate). Asking people to imagine life without art was thought to help evaluation of its importance to them.

In asking who benefits most from community-based arts projects, the respondent has an opportunity to be critical and reflect on their experience of such projects, or express attitudes and maybe prejudices about them and the people who instigate them.

The next section on being in-touch with one's natural environment was also a reflective opportunity for the respondent, and help to remind them of where they desire to be as far as their connection with the natural environment is concerned.

Following on from this, a direct question asks what role if any, art was perceived to play in helping to explain the science. It was believed important to differentiate between visual art such as paintings and drawings, and other types of visuals, e.g. photographs, graphic illustrations and diagrams, to help with understanding the unique impact that visual art might have in connecting people with science. The response to this question was influenced by individuals' definition of art, or what they consider to be art.

Being able to relate this section to other sections was expected to show whether there is a connection between people who claim to be in touch with their natural environment and state that art helps them to understand the science, and conversely, where those who claim they have little connection with their natural environment also state that art does not help them to understand the science. In other words, there was an opportunity to explore the connection between the public's interest in the environment and support for art-science.

**4. The environment – connection with / lifestyle/perceptions of climate change.**

The main aim of this section was to understand the public's relationship with the natural environment, as well as their engagement with the principles and practices of sustainable living. It would provide an indication of intentions and an insight into the feasibility of environmentally friendly behaviour e.g. how practicable it is to avoid packaging or share transport, even with the best intentions?

In asking how respondents would explain what climate change is all about, and to what extent the idea of climate change has or will have an impact on the public, the research would contribute to research within climate change engagement.

**5. Home decision-making and personality – how decisions are made in the home.**

Life priorities, pressures, stresses and opportunities are likely to differ between urban and rural dwelling. The possibility was that this variation would also influence attitudes and behaviour towards art-science collaboration and sustainable living practice. For example, an urban environment is more competitive than a rural one, due to a higher demand and the scarcity of resources. Therefore, people are more likely to be guarded and less co-operative or community-minded in towns and cities. This competition can also influence people to copy or follow each other to keep up and not be left behind. Within this is a higher propensity to be influenced by societal norms and be more psychologically dependent on infrastructure. Rural dwellers tend to be more independent and capable of improvisation and versitility, in other words more resourceful, being under less competitive pressure and more willing to share and co-operate within the community. This trend relates to Collier's (2013) theories about rapid increases in diversity as a result of migration, acting to reduce the tendency for mutual regard and thus co-operation within communities.

Life-priorities can vary, especially between different social classes (Park, 2013), and furthermore, individuals make different judgements and decisions depending on whether they are thinking alone, for themselves, involved in a relationship where joint decisions are made, or are influenced by one party or the other, and particularly as a parent, decisions and behaviour are likely to be influenced by the immediate needs and demands of the children.

The rationale for determining the most influencial person within a family unit, was that any patterns that emerge might be taken into account when designing art-science communication,

in a more targeted way depending on the medium. In addition, the television programmes that are chosen for viewing can have a profound effect on understanding, attitudes and behaviour, in general. Media messages are targeted to specific age groups and can be powerfully influencial in motivating its audience.

This section called upon participants' self-awareness skills. The set of statement choices they were invited to respond to relate to personality and motivation traits. The aim is to be able to divide respondents into two behavioural tendencies in each case, reference Charvet's (1997) Toward / Away-from; Proactive / Reactive; External / Internal - motivation traits. This provided an opportunity to relate theories discussed in the literature review Chapter 3: Art and Human Behaviour.

By stating what they believed threatens life today, participants provided insights of where the public's focus is in terms of perceived safety and security. The answers could provide a perspective on how near or far (geographically), immediate or distant (chronologically) their sense of threat is. Potentially, these could be motivating factors when it comes to action or behaviour. The same applied to the subsequent question relating to the future for their children and grandchildren.

Although at this stage it was difficult to anticipate the value of an answer to the question, participants were asked directly for their opinion on the idea of art-science collaborating to communicate science knowledge and engage people in the environment, towards altering behaviour and climate change impact adaptation.

**6. Conviction for art and science; climate change impacts drawing exercise.**

*Investment*

The public were offered a choice as to how to invest £5000 between art and science projects, to gain insights into their conviction for, and perceptions of art projects, relative to science projects. The participant was in effect, empowered within the decision to commit (hypothetical) funding, or otherwise, towards art-science. The results are interesting and discussed and illustrated by means of a graph, in Chapter 6.

*Drawings*

The final section of the questionnaire involved inviting participants to draw and describe their own, personal visual representation of climate change impacts. The question was worded as follows:

> *"What symbol, sign, icon or wording comes to mind when you think of the impacts of climate change? Try to visualise it and make a simple sketch in the box below"*

In cases where people are happy to describe an image in words, but not confident enough to make a drawing, the researcher assisted by interpreting the respondent's ideas graphically on the form, although this only occurred a couple of times. The aim was to make a collection of graphic images that represent climate change impacts for the public, and analyse them for common themes, presented in Chapter 6. The whole collection of drawings by the public is available to view as Appendix 7 and 8.

A square box was provided on the questionnaire for participants to draw in. This helped produce a standard set of drawings which could be easily collated and analysed. Additional space was available adjacent to the box so that participants could explain their drawings. This proved to be very useful in some cases where drawings were difficult to interpret, or where participants wished to expand their ideas further. All questionnaires and drawings were linked by an identifiable serial number and logged on a spreadsheet table. The four-page questionnaire can be viewed as an Appendix, numbers 4 and 5.

### 4.7.3. Group discussions and Interviews.

**Group discussions**

Group discussions were held with several class groups within the two secondary schools Ysgol Preseli in Crymych, Pembrokeshire and Ysgol Bro Hyddgen in Machynlleth, Powys. The class groups of various ages under eighteen were shown the set of four paintings which were used as part of the field experiment (Section 5). These paintings could be interpreted as depicting climate change impacts, and generally were interpreted as so due to the context, following other climate change related exercises that the students had taken part before the discussion. Firstly, students were encouraged to suggest what each painting was about, in other words, its story. Secondly, they were encouraged to express any emotions that they felt in relation to the visuals.

These two tasks were based on the same questions asked of participants within the field experiment exhibitions in Cardiff and Milford Haven. The sessions lasted around thirty minutes each, and were recorded and summarised, and are discussed in Chapters 6 and 7. The summary transcriptions are included in the Appendices.

The students were enthusiastic and co-operative, and contributed lots of insightful qualitative data to the research findings. In addition to interpreting the story and relating to emotions, participants suggested causes of climate change and mitigatory measures. Certain individuals were more confident, creative and outspoken than others, making it an entertaining experience for everyone; and all the group members were observed to engage with the exercise. The artist's identity was not exposed to any participants until the discussion was over.

**Interviews**

Qualitative, semi-structured conversation-type interviews were conducted with a few key individuals who were considered stakeholders within the context of art-science collaboration and its potential to engage the community in adapting to climate change. These included RSPB Cymru officers at their Head Office in Cardiff, and UNESCO Dyfi Biosphere community members plus Ecodyfi officers. The questions included:

1. Describe your role and whether you feel that it is playing a part in influencing people to change their behaviour.
2. What do you see is the opportunity for art and science working together, in collaboration?
3. What are the barriers / difficulties / challenges, if any?
4. Can you offer any examples of where art and science has come together to influence people, in your experience? Would you say it was successful and how have you made that assessment?
5. What difference does art make, when it comes to getting a message through (or in this case, helping people to understand science knowledge)? What is unique about it? How does art differ, from other types of visual e.g. photographs in the media?
6. How does the prospect of adapting to climate change affect your work?
7. What influence or effect does the prospect of adapting to climate change have on your family life?

8. If you could wave a magic wand and change something about the way we live, to save the planet for the future of our children and grandchildren, what would it be?
9. Do you believe it is possible? What would it take?
10. How has this conversation left you feeling / thinking?

### 4.7.3. Climate Change Image Poll

The aim of this exercise was partly to encourage participation and engagement in the research project in general, and to gain insights into the varying aesthetic impacts of visuals, within the context of climate change. It was designed and used strategically as a simple and quick tool for engagement with the research project.

A selection of ten climate change-related images, of different graphic styles e.g. photographs, cartoons, diagrams and art installation, were chosen via a search on the internet. They were sourced by using search phrases such as "*climate change images*" and "*climate change art/visuals*" and chosen for their range of styles and approaches, e.g. photographs, digital manipulations, graphic illustration and cartoon, etc. The images were printed and mounted on boards which were easily stacked and passed around, or spread on a medium sized table. Instructions were provided to participants which required them to sort quickly through the images and put a cross on the reverse side of the one which they found most disturbing, or that has the most immediate impact.

This was an exercise which took only a few minutes to complete, and was therefore accessible, especially to interested visitors who could not spare time to get involved in other, more time-consuming research activities. It also filled the time between classroom research activities where some participants were slower in completing the tasks, and helped prevent boredom setting in amongst students.

At the end of each session, the crosses on the reverse were counted and logged on the Image Poll chart. A total of four hundred and eight (n=408) participants took part in this exercise, including eighty-one (n=81) under eighteen-year-olds. This set of tools was easily transportable and repeatable at short notice in different locations. This exercise was successful in engaging the public and provided useful quantitative data. Chapter 6 discusses the results.

## 4.8. Analysing images

Several elements of the field research in practice have involved the use of, and creation of artistic visuals, including the five-section field experiment, group discussions around a set of paintings, the image poll and participant drawings within the questionnaires. To assist in deciding on the most effective and appropriate method for analysis of data relating to these activities, a review of methods that have been adopted by researchers previously was carried out. There have been numerous methods developed for analysing images in the past couple of decades, as the impact of visual stimuli is recognised. A review of these methods has helped to inform methodology for analysing data collected within this study.

Terminology around this subject is plentiful, as experts in the field grapple with how to describe, analyse and present the debate around art, visuals and science communication. Visual literacy is emphasised within the importance of "*telling the story*" and the conceptual illustrations of collaboration. (Trumbo, 2000). The average audience member's understanding of scientific subjects (e.g. genetics) is believed to be formed through disconnected visual representations, such as the double helix, a gene map or DNA strands plus other examples. Furthermore, the objective of visual representation is to create images that "*speak*" to the viewer without additional explanation and that the end purpose is to communicate. One could argue that the viewer interprets the visual and tells their own story, thus developing the concept. However, story-telling could be a vital tool for engaging the public through visual communication e.g. science through art, but is not simply about receiving an instruction. The results of Section 5 of the Field Experiment indicate the ease with which the public can respond to artistic representations of climate change impacts with both a narrative (their interpretation of the subject matter) as well as their related feelings about it.

Taking scientific visualisations beyond being for exploration, discovery, analysis and validation of large collections of data, there is the idea that "*beautiful visualisations might be considered works of art*" also (Healey & Enns, 2002). An experiment with basic visual features led to the belief that they could indeed guide the viewer's attention and alter their "*seeing*". Additionally, they concluded that eighty percent (n=25) of viewers consistently preferred realistic images compared with abstract ones.

The experiment with painting styles basic visual features, which they discovered are not large in number and included (in order of most influence) - luminance and hue, orientation, texture and motion and finally, shape (length, area and convexity).

Some studies put emphasis on the importance of being trained to read or interpret images and thereby developing visual literacy, so that images can be produced for purpose as effective communication. At this juncture, our attention is drawn to the opportunity for manipulative use and the ideological implications of images, however, visual literacy also involves "***making judgements*** *of the accuracy, validity and worth of images*", and there is the argument that understanding the implications of images, makes a viewer more resistant to the manipulative uses of images in advertisements and other contexts. (Bamford, 2003). The tools suggested for such communication are syntax and semantics, of which several examples relate to the field research for this project.

Whilst such analytical approaches to the use of visual imagery are useful in certain circumstances, the artist takes a more intuitive approach in achieving the desired effect upon its audience. In other words, an artist can choose between many different paths towards her/his objective. This would suggest that the aim of exerting a certain influence upon the viewer through "*manipulation*" might not be achieved with the "*visually literate*" method supported by Bamford (2003). However, the principle of conveying meanings, through an understanding of the role of syntax and semantics makes sense. Examples of syntax can be found within the Field Experiment e.g., Section 1: Cool/Warm colours; Section 2: Dark, restricted space / Light, open space; Section 3: Symbolism in both abstract and representative style; Section 4: Two versions of one subject with different rhythm and balance.

From a more scientific perspective, and in response to what they describe as a currently huge international effort to understand the science of climate change and its impacts, (as well as a growing awareness of the need to adapt policy and behaviours and to develop possible mitigation strategies), Dockerty, *et al.* (2004*)* explore the possibility of reinterpreting information and presenting it through GIS-based visualisations. This form of digital technology together with 3D object modelling, rendering, animation and computer aided design (CAD) software takes the place of more traditional, but relatively recently used methods such as drawings and water colour paintings like those used in "*Landscapes for Tomorrow*" (O'Riordan et al, 1993).

The critical question is - do these digitally produced images have the same degree of visual impact as a painting produced via direct physical connection between human hand, eye and brush? Perhaps it is immaterial, and these visualisations are intended to inform and not evoke a behaviour-changing response. The motivation for, and value of Dockerty *et al.*'s (2004) work remains unclear, except to acknowledge that digital technology is an efficient and versatile tool.

Within previous studies, more traditional tools have been used to investigate people's spontaneous visualisations and feelings of involvement with climate change. Nicholson-Cole's (2005) study selects three social groups within a range of socio-demographics, although the sample is not strictly representative, and is focused on saliency and efficacy. Findings from the study suggest that visualisations of climate change designed to engage people with the issue must have various characteristics which make them attention grabbing, memorable and likely to trigger some motivation to make behavioural changes. One image alone is unlikely to achieve the requirements for engaging visuals and sets of images accompanied by certain cues are needed (Nicholson-Cole, 2005).

Of relevance to this research project is how Nicholson-Cole (2005) highlights that "*individual psychology must also account fundamentally for people's interpretation of the imagery*". She states that as people are not homogenous in their visual relationship with climate change, there are implications for motivational communication to the public. Similarly, within this project field experiment and stand-alone questionnaire there is a section which attempts to determine personality types and motivation traits by asking participants to choose from a set of statements relating to how they perceive themselves and make decisions day to day. The rationale behind this test relates to the belief that individuals respond differently to images depending upon their own traits.

The media are key actors in the public perceptions of climate change risk (Allan, *et al*. 2000) and are characterized by different framings of the risks associated with climate change in *"Society for Risk Analysis*" (Carvalho & Burgess, 2005).

There is acknowledgement of an urgent need to mitigate and adapt to climate change amongst scientific and policy circles, however, public awareness lags. Although realistic landscape visualisations are considered capable of advancing people's awareness of climate change, the theoretical basis for the effectiveness of visualisations in this role has not been clearly established and Sheppard (2005) says that there are ethical concerns elicited by adopting a

persuasive approach which "deliberately engages the emotions with visual imagery". Refer to the "*supposed neutral role of science in not imposing value judgements on the public*". However, there is an argument for policy to emphasize the need to forestall an actual crisis in the environment as an "*over-riding imperative*". Sheppard (2005) considers the risks in such usage of visualization and these include deliberate attempts to mislead, the risk of biased responses, a lack of credibility, the risk of disbelief, the risk of confusing the public, information overload and instilling fear which leads to a defensive response by the public. The alternative but valid argument is that by encouraging acceptance of climate change, the public might perpetuate the problem. A code of ethics for visualisation is proposed as a remedy (Sheppard, 2005).

However, if public policy wishes to engage the emotions deliberately with visual imagery as an "*over-riding imperative*", it will need to be averse with what works – long term. Perhaps a first step in determining this would be to ask the public. It is reasonable to enquire as to how effective measures have been so far in achieving the same aim? Sheppard's (2005) assessment of the risks suggests there is the possibility of information overload or overkill, confusion and disbelief – in other words – failure. His code of ethics might not represent the most pressing requirement, but a plan for effectiveness does.

Methodology focusing on reading texts aims at understanding rural society and culture. It examines images of rural places, products and people, and how they satisfy the expectation of a specific audience, contrasting ideas about town and country (Yarwood, 2005). Yarwood suggests that:

> *"Geographers should consider the different contexts in which images are produced, consumed and acted upon in order to understand the different views, or truths, of the countryside that are expressed by different elements of society for different reasons".* pp.19-31

Geographers are increasingly drawing on theoretical ideas from the arts and social sciences to analyse images and are applying techniques such as discourse analysis, psychoanalysis, content analysis and semiology to analyse images, referring to Rose (2001) and Hoggart *et al* (2002) for methodologies (Yarwood, 2005).

The poster "*The Tarka Line Rail Ale Trail*" depicting a photo/cartoon montage of an otter holding a pint-jug of frothing ale, and licking its lips, and set against a countryside backdrop is

a good example. The poster advertises the Exeter to Barnstaple Railway. The image is created artistically in the sense of both drawing skill and imagination, evoking positive response and achieving an objective within the tourist industry. However unrealistic it is, most public understand this to be so, but are happy to accept it as a visual that entertains and appeals to their sense of fiction.

Figure 4.16. is a further example in cartoon form by the author's late father, Welsh artist Bill H. B. Thomas (1974). Although not aimed at the tourist industry it addresses an environmental issue. It is a response to investigations into falling numbers of cockles within the Three Rivers area, Carmarthenshire in 1974. The cartoon depicts the wading birds reminiscent of injured soldiers, grieving over their comrade being carried on a stretcher made from wing feathers. The artist's experiences in the RAF during World War II may have inspired this cartoon's design to some extent. The characteristic sandbanks and the industrial building in the background provide a sense of place. The use of such an iconic symbol serves to remind us of humankind's influence and responsibility

Fig.4.16. "*He Didn't Even Like Cockles*" William H B Thomas, 1974


.

This example of anthropomorphism commonly used by cartoonists, is an established and effective method for engaging the viewer by assisting them in relating to the subject. They are drawn-in through emotion, sentiment, humour, irony and sometimes shock and fear. In any case, it makes it easier for the public to engage with the story and to empathise with the plight of the poor, victimised and potentially wrongly-accused wading birds. The visual message is not ambiguous. There is no doubt over the cause, the victim and the executor of castigation. The viewer who is obliged for a moment to be jury, is influenced to think in favour of the Oystercatchers, on this occasion, even though the evidence against the birds is not provided. The cartoon attempts to persuade the audience with one side of the debate only.

Subjective interpretation it seems is key. As with recent empirical, multi method research including the Q-method[22] and VisionS, some assessment of visual power and public engagement has been possible through a mainly qualitative response (O'Neill & Nicholson-Cole, 2009). The images used were representations of different aspects of climate change impacts both in the UK and abroad, with a focus on measuring saliency and efficacy.

By their descriptions, it appears that the images selected by O'Neill, *et al* (2009) were in several cases the same, or contained similar content to those selected for the Climate Change Image Poll, although this was not intentional. Examples of images with similar subject content are: Industrial smoke stacks, cartoon "No ice this winter", turning down domestic thermostat, dead tree in a desert, flooded suburban house, forest fire, house falling off a cliff, starving children in a famine, polar bear jumping across gap in ice and stormy coastal scene at a quay with crashing waves.

For this field research, however, there was a different emphasis made within the selection process. Images were in the main selected for their communication styles, and not because they represented a range of climate change aspects, although they included several images depicting possible climate change impacts such as flooding, drought, and melting ice-caps etc.

22 Q Methodology is a research method used in psychology and in social sciences to study people's "subjectivity"—that is, their viewpoint. Q was developed by psychologist William Stephenson. It has been used both in clinical settings for assessing a patient's progress over time (intra-rater comparison), as well as in research settings to examine how people think about a topic (inter-rater comparisons). See also Van Exel NJA, G de Graaf. Q methodology: A sneak preview. 2005 [available from www.jobvanexel.nl]

The Climate Change Image Poll was limited to ten images aimed at encouraging participation by as many people as possible, even where there were time constraints. Participants were asked to choose the image which stood out most for them, and mark a cross ('X') on the reverse. The task was designed to be brief and require the minimum of time rationalising and intellectualising, to capture a more visceral response. For example, although the selection included the photograph of a fine art installation by Isaac Cordal, it was chosen for its visual impact only. Perhaps it should be noted that the selection process itself would (unavoidably) have been subject to a degree of visceral and intellectual response by the researcher.

Occasionally, participants were asked to explain their choice of image to the researcher, however, this task was purposely designed not to collect reasons for choices as it was believed that potential participants might have approached this task in a more conscious, rationale way, had they been expecting to qualify their choices afterwards. In this way, requiring participants to provide reasons for their choices might have jeopardised the aims of this field research method, which was to investigate the impact of visuals on the public. It was observed by the researcher present, that choices were made on an individual basis and not influenced by other people within their group or locality.

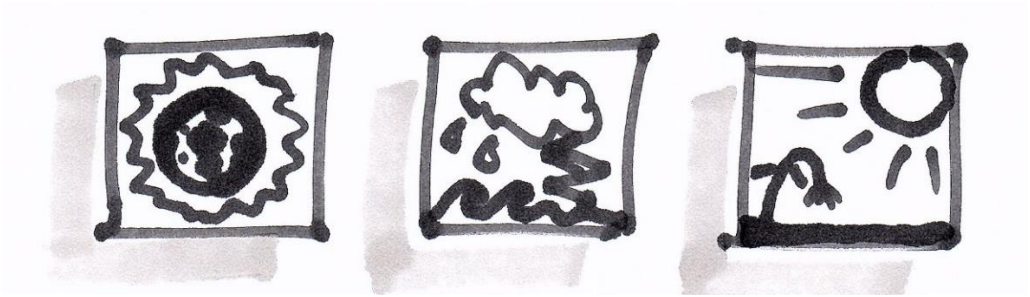
Participants were not aware of previous participants' selections until they had marked it with a cross on the reverse. On average, the task took less than two minutes to complete and involved no discussion. Whilst this was not intended to be a key task, it complemented other methods within the field research and helped to engage people of all age ranges.

O'Neill & Nicholson-Cole's (2009) IconS or Iconic Representations Study involved participants' selection of icons that represent climate change / global warming for them. Sample numbers were as follows: Focus groups 27, Online survey 63. They were asked what they thought would make an engaging icon, before naming their own personal climate icon and explaining their reasoning. In contrast, this research invited participants to *draw* their visualisation of the image that might symbolise climate change impacts for them. This collection of the public's drawings is included in the Appendix, number 7.

Whilst there are several approaches to analysing visuals including Rose, (2001), for the purposes of this research, re-occurring themes have been noted, analysed and illustrated in chart form. The unique drawings lend themselves to semiotic analysis at the very least, but more than that they are examples of reductionism, as well as performing as portentous symbols.

The following example using extracted ideas from the public's drawings (Fig.4.17.) helps to illustrate this:

Fig.4.17. Participant Drawings and Semiology.



| | | | |
|---|---|---|---|
| **Signifier:** | GLOBE | STORMS | SUN |
| **Signified:** | HOME | DESTRUCTION | DEATH |
| | Responsibility | Disruption | Desolation |
| | Ownership | Discomfort | End |

Despite the complex consequences of global warming and climate change, its significance to the public computes in simple terms. A reductionist approach is perhaps most effective in engaging the public towards a shift in behaviour, one which is led by them.

Alternatively, for future research we could ask "*what are these images saying? What is the story?*" van Dijk's (2006) topics of semantic orientation could prove to be a useful analysis tool, i.e.: "*Self-identity descriptions*", "*Activity-descriptions", "Goal-descriptions", "Norm and value descriptions",* amongst others. Selecting examples from the collection of the public's drawings that deliver messages of wisdom, innovation, imagination and the unexpected. Compare this image discourse with existing textual discourse. What unique opportunities do drawings (and similar hand-created images) bring to the climate change debate?

Participants' willingness to try their hands at the drawing task proved to be a humbling experience for the researcher. The analysis of these drawings was expected to provide an insight into the depth and quality of the public's engagement with the subject, as well as some pointers for art as a collaborating force.

Shocking, catastrophic and large-scale representations (whilst providing a hook for people's attention) "*clearly do not motivate a sense of personal engagement*". Furthermore,

communications approaches that take account of individuals' personal points of reference are more likely to be meaningfully engaging, when it comes to climate change (O'Neill & Nicholson-Cole, 2009). Within more recent research, it is found that few, if any mass media images promote both a sense of salience and efficacy, however a multiple criterion of evaluation, from deep-seated ideological perspectives to ephemeral influences of mood, can shape responses (O'Neill, 2012). Methods involving thirteen newspapers throughout 2010 and an image content analysis to investigate the loudness or quantity of types, used a concept of framing within denotative content (literal meaning), connotative content (cultural structure) and ideological content (intrinsic meaning and attitude). Note: Climate change imagery was covered more considerably in the UK at between 18-41% (ave. 23%). Also, the presence of polar bear imagery only existed in the UK at between 5-6%, in the Sun, Express and Daily Mail (O'Neill, 2013).

Under the distancing visual framing, it was found that whilst smokestacks may be seen in industrialized cities, it suggests a disconnection between industrial production of energy and consumption of that energy on a personal level. O'Neill's (2013) research investigating engagement with climate change imagery indicates that images of smokestacks provoke strongly negatively-valenced emotions, and they leave people feeling overwhelmed and powerless to act (O'Neill and Nicholson-Cole, 2009).

This result differs somewhat to the field research indications within this Art-Science project, and angry emotional reactions to pollution, such as in "*Natural Selection*" Field (2011).

One of the images described by O'Neill's (2013) study matches one of the images used in this project's 'Climate Change Image Poll" as mentioned earlier. The image depicts a helpless-looking young child alone in a barren landscape. It ranks first place in terms of being chosen as one image out of ten that has the most impact (around 50%). It is described by O'Neill (2013) as "*emotionless, a faceless example of distant climate change impacts*". The Guardian newspaper that published the image stated that the figure is a young boy from the Turkana tribe, Kenya, standing on a dried river bed. One explanation for this is that perhaps O'Neill (2013) over-analyses this image in her study, as with other similar imagery studies, and the raw impact on the public is under-appreciated as an influence. In other words, perhaps it is unhelpful to pay attention to detail within the analysis, when a simpler assessment of response could prove more insightful.

A similar example is the polar bear imagery, published frequently in several UK newspapers, but not elsewhere. O'Neill (2013) says "*these clichéd images tend to show mother and cubs in classically emotive ways and whilst this ice imagery is beautiful and awe-inspiring, the geographical distance between viewer and scene…strongly evoke the visual frame of climate as distant to the everyday*".

In contradiction, the "Stranded Polar Bear" image included within this project's set of ten climate change images Poll ranks second most popularly chosen as having impact. It seems that it catches the eye of the viewer through being aesthetically pleasing (pastel shades of blue ice and snow) and there is also the sentimental, nurturing and pitying instinct playing out within the selection process. So, although this type of image can be thought of as clichéd (and even perhaps unworthy "*fluffy bunny stuff"* as was once described by an environmental lecturer some years ago), its impact cannot be denied. It is evocative - there is no doubt, together with the image of the helpless child alone in a barren landscape. When asked, what led them to choose this image in the Poll, participants confessed that the "*helpless child*" alone in the barren landscape was the main (and only) reason for choosing it. The UK flooding scene which shows cars floating within a housing estate attracted only 5.9% of a vote, which is surprising when studies have indicated a stronger engagement by the public with images depicting local climate change impacts (O'Neill, *et al* (2012)).

**Comparison of previous studies with this research**

- No other studies have been found to have used artistic, non-photographic visuals.
- This research has sampled a larger number of participants, spanning wider age range, in three separate geographical locations within Wales, UK.
- Previous approaches appear to be systematic whereas this research, although having some analytical elements to its design and interpretation, makes use of a more intuitive approach akin to artistic character.
- This research puts more emphasis on the mechanism of response to visuals.
- This research takes us back a few steps, back to the basics of human engagement? This field research is not developed from others work, but might be useful as a foundation to others work.
- The *Pick-A-Card* images were chosen for different graphic styles mainly, but included different climate change impacts such as flooding, drought, evolution, glacial melt etc.
- In contrast to other research, this study looks at why responses can vary between individuals (and not how images need to be varied) e.g. Experiment section 1, 2 and especially 3.

- Participants were invited to go one step further and draw their visualisations, and not simply describe them.
- Participants were invited to make their own interpretations of artistic visuals (paintings) and relate to their emotions, independently, with no cues and minimum intervention or guidance from the researcher (facilitator). The ambiguous quality of the images encouraged creative interpretative ideas.
- The only context for the experiment was climate change and global warming.
- The images which portrayed portentous themes appeared to fire-up passion for action and change (through pity, regret, confusion, pride, anger and disgust), which suggested a degree of efficacy, unlike results reported by previous studies.
- None of the artistic visuals depicted climate change solutions or energy futures, but could be included in the design of further similar experimental work.

**Overall**

Previous studies have focussed on saliency and efficacy, analysing photographic images in media and using them in discussions to gain insights into perceptions of CC. Some used small sample numbers (30) and other reviews surveyed as many as 3,014 across three countries. Participants were asked to describe ideas (visualisations) and discuss themes presented. Structured analysis was used on content and for compositional interpretation. To date "*little is known about how to effectively engage the public using the visual medium"* (Corner, et al, 2016).

On reflection, the open-mindedness and ease with which public engaged with all images, especially in case of abstract versus representational (although this might depend on how obscure an image is) was surprising. The public needed very little or no encouragement to make their own drawings, which was unexpected.

## 4.9. Chapter Summary

This chapter introduced the methodology, both conventional and experimental, for field research carried out within this project to explore and respond to the key research questions identified in Chapter 1. It explains the rationale, context, impetus and positionality of the researcher and then provides details of the planning and design for field research activities. Finally, in relation to the analysis and interpretation of visual data, there is a review of approaches to analysing images that have been adopted in the past.

This unique field research allowed the artist/scientist researcher to observe and experience the alchemy between visual art and environmental science, once again. The raft of empirical data collection methods explained here has provided insights into how the public engage with art, within a context of climate change. In effect, the viewer (participant) engaged to recall their own experiences and interpret the visuals within the experiment and by drawing, in a process of reflection, to make sense of a public global reality. They related to life and other people through art.

The study has enabled us to visit the characteristics of engagement and the relationship between rationality and emotions, and provided a wide range and volume of data from public aged between eleven and eighty. Perhaps most pertinent is the contribution by the public, resulting from this field research, of ideas for effective ways of making a visual impact towards climate change adaptation. Interaction between public and artistic visuals is nothing new, of course, and in acknowledgement of this relationship, Chapter 5 explores the art of human crisis, and discusses examples of visual art relating to extreme weather events, wartime Britain and climate change.

# CHAPTER 5: The Art of Human Crisis

## 5.1. Introduction

Artists' roles are being defined and re-defined by a diversity of experts as ethnographers, anthropologists, researchers, neurologists, psychologists, activists and many more besides. Whether artists fulfil any one of these roles or perhaps several of them, they have risen to the challenge to illustrate, record, convey, influence and shift behaviour along humankind's perilous leaps from crisis to crisis. Whereas Chapters 2 and 3 looked at the relationships between art, science, geography and human behaviour, this chapter examines three examples of art collaboration in times of human crisis, and considers the empirical evidence that supports the field data generated and discussed in Chapters 6 and 7.

Here we explore samples of artistic images, sourced online, which relate to three periods of extreme events and human crisis to better understand art's role within the public domain, at times of stress, and to help us appreciate it's potential and opportunity going forward. It looks at three periods, extreme weather events, World War II posters, and climate change visuals, and comments from an artist/researcher point of view, in terms of their scope for engaging the public. The works included in each section have been chosen as examples of the variety of styles and approaches used and are by no means representative. The perspectives of the artist-scientist author have shaped this speculative review and its approach to selection, analysis, and discussion around the nature and the value of the selected images included. This is not a systematic analysis, and does not set out to challenge art historians or art-critique professionals. Alternative approaches to a review of artistic images within public engagement might be considered for future research.

The review aimed to identify art's unique contribution and impact, within a defined context, and how that might have altered through time. It explores the different approaches to engaging the public through art, within a defined context, thus informing the discussion around the main research questions, i.e. how the public engage with art and what opportunity there is for art-science within climate change adaptation.

Chapter 6 follows with an analysis and interpretation of ways in which the public engaged with the field research activities, focussing mainly on their interaction with the test-kit of artistic visuals set within a context of climate change, as well as participation in drawing. Chapter 7 discusses the opportunity to build upon the public responses to this experimental field research within behaviour change in the environment, and climate change adaptation.

## 5.2. Art of Extreme Weather Events

Throughout hundreds of years artists have depicted extreme weather events as a way of trying to understand, and come to terms with something that the public knew very little about, in the way of causes, impacts and reasons, asking whether it was punishment for wrong-doings, etc. Paintings represented how the public perceived what was going on, within their environment. Reasons for these events were conveyed through folklore, story-telling and religion, and most of the population could not read texts. Consequently, these pictorial accounts served to communicate, inform and educate, and potentially influence behaviour. Today, they serve as a useful archival record of the event. Additionally, there is often tacit knowledge within artistic visuals which geographers might find easier to work with than scientists, as mentioned in Chapter 2; 2.6.

The sample of paintings and etchings included here were selected following an extensive search online using keywords and phrases such as "*art of extreme weather events, floods, storms, landslides, ice-age, big freeze, droughts and other related descriptions."*. Where there were banks of historic weather-related events these were searched as images, as opposed to textual accounts, which also provided related images mainly in the form of paintings, and some photographic material for more recent years (late 19$^{th}$- 20$^{th}$ Century). The selected artistic works coincide with extreme weather events and are represented in graph form using data recording "*Temperature Anomaly*[23] *(*$^{o}$*C wrt*[24] *1961-90)*" (see Fig. 5.2.).

[23] The term temperature anomaly means a departure from a reference value or long-term average. A positive anomaly indicates that the observed temperature was warmer than the reference value, while a negative anomaly indicates that the observed temperature was cooler than the reference value (NOA, 2017).
[24] The abbreviation "wrt) means "with reference to".

Fig. 5.1. www.skepticalscience.com. http://www.skepticalscience.com/medieval-warm-period.htm

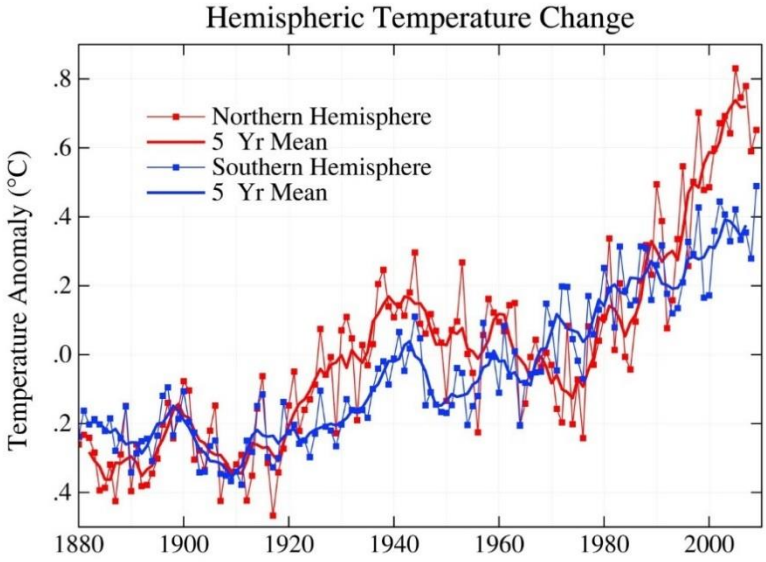


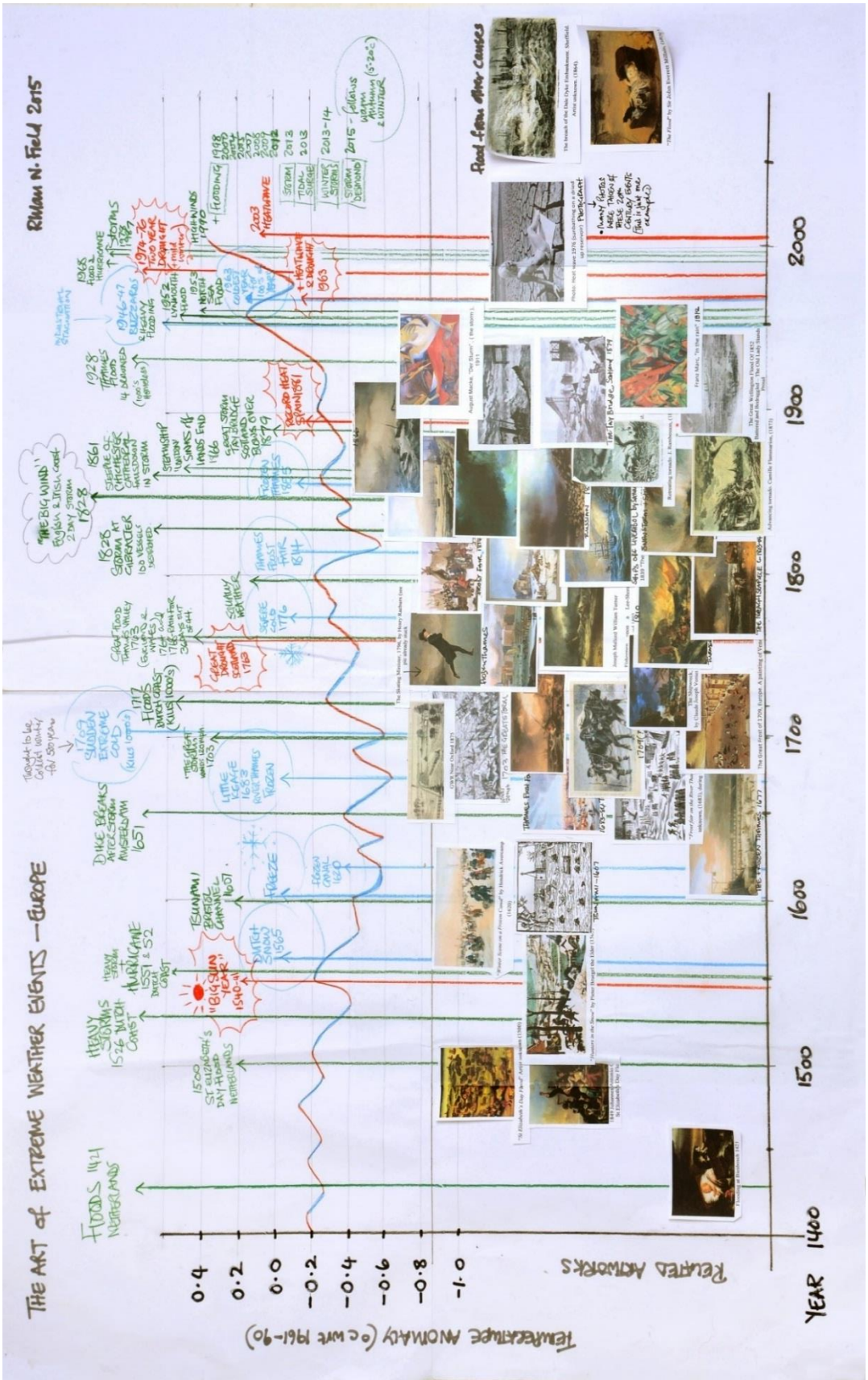

Figure 5.1. Illustrates the trend in temperature highs and lows since temperatures were first recorded in 1880. It charts temperature anomalies for both Northern and Southern Hemispheres.

Specific extreme weather events within the period studied were noted, and an online search made for images which related to or coincided with these events. Several of the main events were indicated by a vertical line and labelled, on the graph. The example images used in Fig.5.2. on the next page, were selected as having represented (and coincided with) weather events of different periods, annotated on the chart, between 1400AD and 2000AD.

The graph (Fig 5.2.) shows us:

1. Extreme weather events between 1400 and Current day.
2. A timeline of average temperature anomaly highs and lows – highlighting periods of extreme weather events such as a big freeze, snow, storms, floods and drought.
3. A selection of artworks found to represent an extreme weather event, giving us an insight into the climatic atmosphere, related effects on the environment and human behaviour e.g. ice-skating, frost fairs, loss, destruction, bravery, hardship, entrepreneurship and adaptation, etc.

Fig.5.2. The art of extreme weather events and coinciding artworks between 1400 and 2000.



Through the years since the 15th Century, artists have captured the impacts and atmosphere of extreme weather events in paintings, engravings and woodcut printing. These weather events include a range of naturally occurring climatic conditions including high winds, heavy rain, lightning, swollen rivers, burst river banks, storm surges, tsunamis, tornados, snow and ice. Most commonly occurring of all is the apocalyptic flood, where humankind, with instincts, loved-ones and treasured possessions all meet in one landscape. The scene is laid under a dramatic sky, which in many cases takes up the top two thirds of the space of a canvas. As an exception, the Middle-Ages artists' record of events, dedicates most of the canvas space to the water, the people and animals inadvertently floating in it.

The Guardian has published a list of "*The 10 most apocalyptic floods in art*" by Jonathan Jones, 17th February 2014. The earliest example is The St. Elizabeth's Day Flood 1421 (Fig.5.3 No. 1.) which is set in the Netherlands. It is stated that the artist captured the disaster to remind the Dutch of what could happen if they dropped their guard. In this way, it would have served as a motivator for adaptation.

There are also artworks depicting tornados of dynamic form which naturally lend themselves to creative compositions, however, the impacts of droughts can be subtler, not so dramatic, and therefore more challenging to convey artistically it seems. One could say "*a dry subject is a dead subject*", devoid of movement and life.

The examples of artworks included in the graph share characteristics:

- They are visually dramatic and evocative
- They create dynamic movement (non-static)
- They are aesthetically pleasing, perhaps even romantic
- They tell a human story.

The artworks could be said to possess qualities unique to (hand-constructed) art, in contrast to photography, and therefore function in a broader capacity. The graph simply demonstrates how the production of artworks often coincided with extreme weather events, and most likely served as documentary evidence at the time, and since. There are many questions surrounding their purpose, objective, motivation and audience, however, for this study, it is their usefulness as a story or record of events that is acknowledged, similarly,

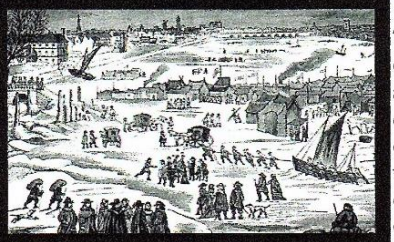
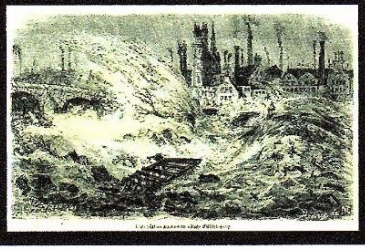
the conspicuous absence of such types of artworks around the time of the introduction of photography.

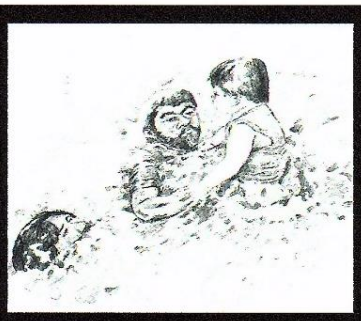
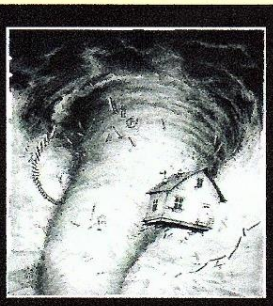
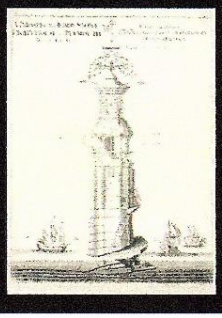
It was observed that since the invention and widespread use of photography (around late 19th Century), examples of extreme weather-inspired artworks, specifically paintings, are difficult to find. A single photograph has been included on the chart as a gesture of the take-over of photography and the dwindling of paintings and drawings, within the context. However, there is a sizeable bank of extreme weather-related photographs available to view online. They act as documentary archival material as well as being aesthetically pleasing, creative and evocative. A further study of the beginnings and subsequent years of photography, which has been stimulated by extreme weather events would be interesting from the point of view of their motive, function and effect. Some photographic visuals have been included within the third section of this chapter under "*Art of Climate Change*".

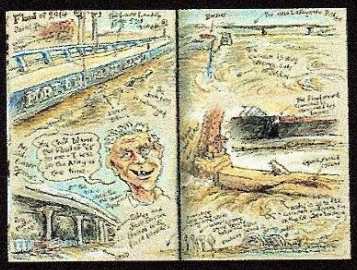
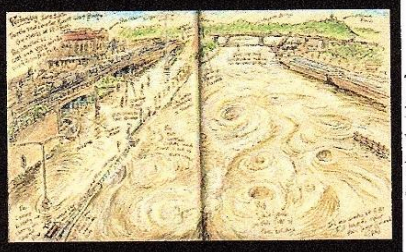
Please turn to the following pages for Figure 5.3. Table of examples of art depicting extreme weather images numbered 1 – 20.

Fig.5.3. Examples of art depicting extreme weather No.'s 1 – 20

| WEATHER: Period 1400-2000 | | | |
|---|---|---|---|
| 1 | St Elizabeth's Day Flood; artist unknown (1500) |  | The earliest examples of art depicting extreme weather events of the early 1400s is found in the Dutch 'true-to-life' impressive paintings of the "*St Elizabeth's Day Flood*", in Dordrecht. A huge storm led to a surge of water which travelled far up into the delta, breaching the dykes and drowning 21 villages. The artist captured the disaster in 1500 when the memory of the impact of the flood was still raw, perhaps to remind the Dutch of what could happen if they dropped their guard. |
| 2 | The Destruction of Sodom and Gomorah; Joh Martin (1852) |  | This next example is a biblical representation of "*The Destruction of Sodom and Gomorrah*", by John Martin (1852). There is a great sense of distance as well as angry, punishing atmospheric forces pressing down upon the land and the people. The fork lightning comes out from the inky cloud directly towards the poor soul in the centre of the painting. Is this an exaggerated weather event or is it based upon the artist's experience? Either way, it conveys the vulnerability of humankind and civilisation in the face of natural forces, even though it may have been designed to scare the living daylights out of all god-fearing mortals. |
| 3 | Noah's Sacrifice; Daniel Maclise (1847) |  | A further biblical example is "*Noah's Sacrifice*" by Daniel Maclise, (1847). We are led to understand that the flood is over and the rainbow is a symbol of hope. The different weather characteristics are relied upon by the artist to convey controlling influences upon both man and animal. |
| 4 | After the Deluge; Cornelius Cornelisz. Van Haarlam (circa 1588) |  | Cornelis Cornelisz. van Haarlam's (circa 1588) "*After the Deluge*" is an entanglement of muscled human form – man, woman and child, curiously with barely a garment in sight. It is difficult to tell which of the figures are dead or alive and the pastel tones used in this work almost represent a 'total wash-out'. However, its domination within the frame by these figures tells us this story is about the human condition and not our relationship with the elements. |

| | | | |
|---|---|---|---|
| 5 | Hunters in the Snow; Pieter Bruegel the Elder (1565) |  | Artworks of snow and ice scenes take on a different atmosphere which is more serene, quiet and calm. The example shown here of "*Hunters in the Snow*" by Pieter Bruegel the Elder (1565), also tells us how people lived with this weather event, managing both work related tasks and taking advantage of extraordinary opportunities for socialising, whether they are ice-skating or gathered together in groups. These scenes certainly do not depict struggle and hardship, only opportunity in an adaptable community. |
| 6 | Winter landscape with ice-skaters; , (c. 1608), Hendrick Avercamp |  | Similarly to number 5, this scene depicts and so visually describes how the freezing weather impacted on the public, bringing hardships, challenges and opportunity, as well as entertainment. The viewer cannot help but feel excitement and a sense of social growth, from this painting. |
| 7 | Frost Fair on the River Thames in London; artist unknown, (1683). |  | This engraving gives the overall impression of everyone being outdoors, industrious and bustling around. One would assume it to be a 'noisy' environment to be in as there appears to be plenty of conversation taking place between groups and teams of labouring townsmen. There is at least one couple out walking and a juggler providing further entertainment |
| 8 | Winter Scene on a Frozen Canal; Hendrick Avercamp (1620) |  | This frozen canal appears to have become a meeting place as well as a 'highway'. Groups of people stop, converse and socialise. |
| 9 | Unknown |  | This wood-cut contrasts with the engraving below in 10.. Both of these weather events would have been disastrous for the communities. One seems like an almost stress-free event whilst the other is gives the impression of devastation |
| 10 | The breach of the Dale Dyke Embankment; artist unknown (1864) |  | This engraving relates to flooding caused by the breach of the Dale Dyke Embankment, Sheffield in 1864 (artist not confirmed), and not a natural event, however, it gives a truer impression of the impact of flood waters than the wood-cut in 9 above.. |

| | | | |
|---|---|---|---|
| 11 | Family Overcome by a Flash Flood; Pete Cramblit (no date) |  | This image by Pete Cramblit "Family Overcome by a Flash Flood" could be described as disturbingly realistic, even in its pencil-drawn form. This evocative but simply-executed depiction of el Nino floods in Peru (2003), brings the viewer almost into the scene, as if they are close enough to be able to help save the victims clinging on to life |
| 12 | Trombe sur terre - Retreating tornado; J. Rambosson (1869) |  | "Trombe sur terre" by J. Rambosson, (1869), shows the destruction after the passing of the tornado. Timber debris, as well as human casualties can be seen in the foreground, and the tornado which we are to assume is travelling away from the scene, has gathered up objects in its funnel. |
| 13 | Advancing tornado; Camille Flammarion (1873) |  | This second example of tornados by Camille Flammarion (1873) depicts the fast approaching tornado, a village church and a mother and her children running for shelter, towards her cottage. There is fork lightening in both these engravings, executed in very similar ways, converging on the tornado |
| 14 | Tornado; Tony Lombardo Illustration (no date) |  | This next artwork depicting a timber house swept up into a monstrous tornado funnel has a cartoon-like aesthetic quality, and makes for more of a characterisation. Window, wheels and train-tracks swirl around in the whirlwinds, up towards a dark place in 'the heavens' |
| 15 | A Prospect of Eddystone Lighthouse near Plymouth; Devon (c. 1698). Engraving by I. Sturt after drawing by Jaaziell Johnstone |  | The first Eddystone lighthouse was completed around 1699 and destroyed by a severe storm in 1703 – less than five years later. This engraving serves as an important and interesting record of the lighthouse that might have been otherwise forgotten and unappreciated. It also serves as a reminder of the severity of the weather event and consequences. |

| | | | |
|---|---|---|---|
| 16 | The American Way; Margaret Bourke-White (1937) |  | The cartoonist and the photographer create an ironic message via the following image by Margaret Bourke-White (1937) in Kentucky, U.S. The photograph was published in LIFE Magazine, 1937. Shot during the Great Depression while covering the localized catastrophe, namely, the Ohio River Flood of 1937. |
| 17 | Ken Avidor (2014) Mississippi River Floods, days 1 & 2. |  | Ken Avidor's diary in 2014 tell the story of the Mississippi River floods, covering several days. He happens to be an active 'urban sketcher' and maintains a daily illustrated journal. |
| 18 | Ken Avidor (2014) Mississippi River Floods, day 4. |  | The somewhat exaggerated whirlpools allow us to fully grasp the dynamics of the body of water which monopolises the landscape, for this temporary event. The effect is achieved by means of observation, patterns, shadows and highlights. |
| 19 | "Suffering Seal" Carlos Caetano (date unconfirmed) |  | Th photographic image "Suffering Seal" can almost be 'heard'. We imagine the distressed call for help (water) of the seal on the mosaic of cracked earth, caused by drought. |
| 20 | "Drought Survivors", Alexandre Hogue, (1930s). |  | This 1930s painting is both beautiful and desperately depressing. It could be described as a design, or a sad cartoon and it visually describes defeat for 'man and his beast' whilst acknowledging victory for the small critter popping up through its hole in the sand. The pastel shades and soft curves lend themselves to dreamy contemplation in contrast to the stark reality of drought. Of course, the distinct lack of rain means beautiful turquoise skies and the warm glow of uninterrupted sunlight. |

Weather, or meteorology has been a source of fascination throughout the history of humankind, since the work of Aristotle, Meteorologica, written around 340 BC, the oldest treatise dedicated to meteorology. As farmers and hunters, ancestral men were heavily dependent on weather conditions, forcing them to observe atmospheric phenomena for signs that could predict future weather—usually up to forty-eight hours. This could be said to be true even today. It is obvious that the more sophisticated and complex societies become, the more urgent need there is of the true knowledge of the weather. However, the transmission of this knowledge to a language aimed at the needs of the public sphere has proven to be a difficult point for researchers. Regarding this problem, the concern and appreciation of meteorology show great variation among societies, depending on how protected they feel in the face of atmospheric weather (Figueiredo Neves, *et al*. 2017). Even today it is probably the most talked-about topic in the street. Meteorological predictions are becoming more and more accurate and so the extreme weather events do not come as quite the surprise that they might have done previously.

The artists' motivation for the artworks varies, although they appear to focus on biblical representations, historical record-making and for beauty's sake or for purely aesthetic reasons. However, some could be described as illustrative, expeditionary, documentary and journalistic, although it is likely that fashion and politics would have had an influence on the style, technique and the content of the work at the time. Perhaps the most creative depiction of extreme atmospheric events is to be found within futuristic and fantasy art which compares with art of the myths and bible stories, for example in Fig 5.6. Climate Change - image No.1.

**Extreme weather as punishment**

The biblical representation of "*The Destruction of Sodom and Gomorrah*", by John Martin (1852) offers a great sense of distance as well as angry, punishing atmospheric forces pressing down upon the land and the people. The fork lightning comes out from the inky cloud directly towards the poor soul in the centre of the painting. Is this an exaggerated weather event or is it based upon the artist's experience? Either way, it conveys the vulnerability of humankind and civilisation in the face of natural forces, even though it may have been designed to scare the living daylights out of all god-fearing mortals. This type of work illustrates a complex narrative designed to have an impact on the public audience of the time.

In *"Frost fair*", (1683) the social atmosphere created reminds us of how communities unite and come out to play during times of unusually heavy snowfalls. One explanation for this altered

behaviour is that the forced change of environment re-prioritizes the mind, and acts as temporary relief from the feelings of stress derived from routine and daily life. In other words, it possibly facilitates more creative and playful thinking, providing positive mental stimulation, which leads to a more sociable disposition. From this perspective, it has a journalistic quality and an aesthetically pleasing aspect also, portraying positive outcomes from extreme climatic conditions.

**Documentary**

Artwork that appears to document real-life flooding events during the early Middle-Ages, does so in an apparently factual and organised way, evenly spacing the floating objects, people and animals within the scene, none of which even brushes shoulders with the other, which makes for a curious interpretation of what must have been a chaotic and confusing event. This wood-cut (below, left), contrasts with the engraving on the right. Both weather events would have been disastrous for the communities. One seems like an almost stress-free event whilst the other is gives the impression of devastation. This engraving relates to flooding caused by the breach of the Dale Dyke Embankment, Sheffield in 1864 (artist not confirmed), and not a natural event, however, it gives a truer impression of the impact of flood waters than the wood-cut.

**Beyond documentary**

A further, but contrasting example is the depiction in Figure 5.4. of the Sheffield flood victims, "*The Flood"* by John Everett Millais.

Fig.5.4. "*The Flood*" by Sir John Everett Millais, (1870)

Newspapers reported there had been a baby, still in its cradle, being swept away in the swift flowing waters. Millais' (1870) perspective on the tragic event was a much more personal one. He creates a complex visual story poised for interpretation by the viewer. It focuses on individual consequence as opposed to providing a journalistic coverage in pictures. Even the jug floating nearby is a reminder of our ancestry and what has made us human, as well as the finely hand-crafted wooden crib. The oblivious infant is ironically wonderstruck by the passing clouds above the gliding twigs, and the kitten (not cat) amplifies the vulnerability of the two creatures. Our thoughts lead to "*whose infant is this? Where is the mother…or father? Did they survive, or is this child all alone in the world? Will the child survive…the kitten too?"* Such an image as this could not be captured by photographic means. It is both beautiful and disconcerting, as we, the viewer, look on powerlessly.

Looking at Fig. 5.2. No.11, we assume this is a family – mother and father with young son or daughter in arms. The father's facial expression is somewhat neutral although some might say he is focussed and determined to save the child. It is very engaging and evokes feelings of anxiety ("*this family could be mine*"), an awareness of mutual regard and a sense of responsibility. It would be difficult to get closer to the impacts of extreme weather than this sketch brings you, the viewer. [re-word]

Lombardo's "Tornado" (Fig. 5.2. No. 14) is a snap-shot of a scene of devastation where evidence of humankind and nature blend as one soup. Despite its dramatic impact, this depiction could be described as wondrous and amusing. This image offers something over and above that of the previous tornado engravings as it keeps your eye fixed and exploring the story created by the artist.

**Irony and inequality**

The cartoonist and the photographer create an ironic message via the photographic image by Margaret Bourke-White (1937) in Kentucky, U.S. (Fig. 5.2. No.16) The photograph was published in LIFE Magazine, 1937. This is what Ben Cosgrove wrote about it, March 2014:

> *"Like popular songs and fashions, some photographs have the power to define eras. Bourke-White's now-classic photograph, while it was certainly shot during the Great Depression, was in fact originally only one of many pictures she made while covering a far more particular, localized catastrophe: namely, the devastating Ohio*

> *River flood of 1937 which claimed close to 400 lives and left roughly one million people homeless across five states in the winter of that terrible year.*
>
> *Bourke-White's picture led off a feature in the Feb. 15, 1937, issue of LIFE magazine that focused on how the flood waters ravaged Louisville, Ky., a city, LIFE wrote, that "will henceforth rank with Johnstown in 1889 and Dayton in 1913 among the worst-flooded cities in American history." LIFE published a half-dozen Bourke-White photos from Louisville in that issue, and while the "American Way" billboard image was, even then, clearly the strongest of the bunch, it's worth recalling that it was, after all, made during one specific assignment, covering one specific disaster. That it has grown in subsequent decades into an iconic image that epitomizes an entire age perhaps says as much about Bourke-White's artistry, and LIFE magazine's influence, as it does about the (understandable)* ***human tendency to look for meaning—or connection, or solace—in what's before our eyes."*** (no page number***)***

These words confirm the important role of the story and the general public's inclination to piece together the elements, to find relevance to their own lives. Although this image does not depict an extreme weather event as such, it could be said to act as a reminder that in times of natural disaster, it is the poorest that suffer the most, and that powerful graphics or visuals convey it most efficiently.

## Documentary drawings

If only more of these had been made during dramatic, historical weather event, such as the Bristol Channel floods of 1607. Some might argue that photographs would have covered the events in images, just as well. However, the artist is choosing to highlight certain aspects, ignoring others which he deems unnecessary to the story, and adding pertinent annotations. He draws out attention to the detail that he believes is important to note, and in doing so, adds a further dimension. In fact, some of the descriptions allow us to imagine not simply how it looked but also how it *sounded*, e.g. the logs jamming against the bridge, the strong winds, the whirling of the eddies, the droning of the pumps and the gulls.

The somewhat exaggerated whirlpools allow us to fully grasp the dynamics of the body of water which monopolises the landscape, for this temporary event. The effect is achieved by means of observation, patterns, shadows and highlights. The full extent of this movement would not be evident in a photograph of the surface, which reflects light, masking the detail

through the lens of the camera[25]. A more dynamic appreciation of water movement can be achieved through means of video; however, this sketch shows that art can produce a still that illustrates water's movement proficiently and our eye-brain *bio-technology*[26] can receive and understand it.

**Summary**

In summary, it is evident that visual art has played a significant role in relation to periods of adverse meteorological conditions. This study has involved a conscious selection of interesting images examples of the development and scope of extreme weather depictions by artists. There are many more in existence and worthy of acknowledgement. What stands out is that art has no boundaries and limitations when it comes to possibilities, especially in modern times. Artistic creations are often beyond any expectation or speculation that could be made, and the uniqueness of the individual artist is key to this. However, no artistic creation can be valued without the unique subjective interpretation of the individual viewer. This is collaboration on the ground.

## 5.3. Art of World War II: Public Posters 1939-1945

Comparatively, paintings of tornados and floods as seen in 5.2., like public information posters such as those displayed during World War II, served to inform and help the public understand the events surrounding them. Although wartime public posters are not weather related, they provide a useful example of art with an agenda (to influence behaviour) and design for necessary public engagement, in times of stress and threat to survival. Therefore, it would be reasonable to suggest that it is relevant to examine them alongside climate change posters, and other forms of visuals. World War II Posters were used as vehicles of communication from the perspectives of social psychology, us versus them propaganda techniques, and twentieth century theories of semiotics (McCrann, 2009). Posters were displayed in public places, such as railways and The Underground in London, and were accessible by anyone passing by, which makes them different from notices or cartoons which might have been printed in publications and exclusive to readers and subscribers. Today's more independent-thinking public are not so ready to accept what they are being told they should do by government and authorities. They

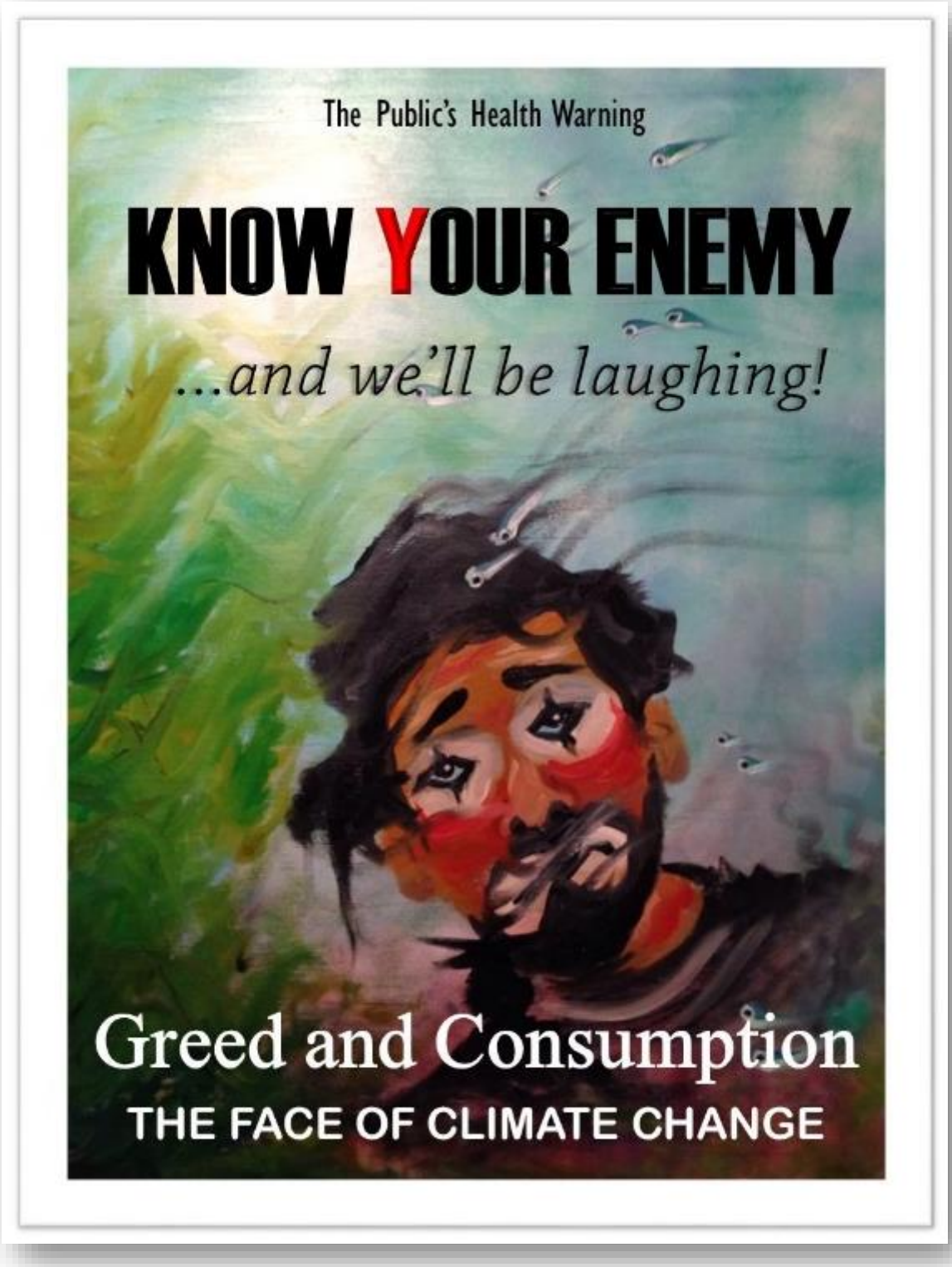
[25] Polarizing filters can help manage reflections and suppress glare to an extent, from reflected light on water.
[26] Bio-technology is used in this context to refer to human sight and cognitive equipment in a comparison with photographic/videographic technology. It does not relate to the modification of living organisms.

are not as suggestible as they might have been in the 1940's, and struggle with authority where there is no satisfactory explanation. Added to this is the perceived lack of a need for urgency, as compared with the immediate urgency of the threat of invasion and loss of freedom posed by Germany in 1939-1945. Food became scarce, materials and general goods became scarce, husbands, brothers and sons left the home and their jobs to join the military forces. There was immediate evidence of change and the need to improvise, make-do, become innovative, have tolerance, humility, share, compromise and above all – unite and cooperate. The enemy was easily identifiable, and so too the potential threats and impacts to normal living.

Responses from field research indicated that in today's peacetime, threats are perceived to be posed from several directions including terrorism, global corporations, rapid industrialisation, religion, terroism, resource wars, growing populations and resistence to sustainability due to greed and self indulgence. Today's enemy within the UK is not eaily recognisable, relative to times of war. Indications are that climate change is certainly not considered as our main threat to life. This prompts the question as to how we direct our resources, and the poster in Figure 5.5. is an artistic proposal of how we might look at climate change as a threat by identifying the enemy that poses it, today. One key element of this poster design is the ownership of the message. Note the first line of text "*The Public's Health Warning*", intended as a message *from* the public, *to* the public, in contrast to those which were designed by governement in 1940's Britain. The main character, the clown, represents everyman, the human condition of denial, as well as vulnerability. The smile and the tears acknowledges that humankind copes with the stresses of its environment by adopting survival strategies which involve humour and play-acting, in front of an audience as litmust test for acceptablilty within society.

Masks and makeup are worn in the form of material posessions such as branded clothing, cars, gadgets, badges, status etc., and words communicated via the media and on-the-street, are repeated and beantered around, so as to give the impression of wealth, resilience and success. The reality behind the façade is often one of self-doubt, insecurity and confusion. The idea of "Know Your Enemy" and the contrasting letter "Y" is intended to suggest that the enemy is both "Yours" and "Ours" (if you remove the letter "Y" depicted in red), i.e. we are in this together. This focuses on the idea of unity within the community. The artist has given climate change impacts a face, hence the clown portrait, sinking to the bottom of the sea looking pityfull, while the enemy (or culprit) is pinpointed succinctly as greed and consumption, taking us to the wider horizon of big-scale greedy capitalism and the forces that drive consumption.

Fig.5.5 "*Know Your Enemy*" 21st Century Public Poster. © RhianFieldArt (2017)



This poster reflects field research participants' convictions relating to the causes of potential threats from climate change. In defence of the public, they buy what is made available to them, provided it delivers gratification at a reasonable price. Supercapitalism gives us great deals as consumers and investors, without our even troubling to ask for them. Unfortunately, it gives us bad deals as citizens. Drowning us in waste is just one of them (Wilby, 2008). And ironically it could literally drown us through the impacts of climate change.

Although this poster was produced since field research activities, it was shown to a small number of public for their responses, which ranged from one word "*Brilliant*", to more comprehensive comments:

> *"It demonstrates the retribution that human beings will undergo when climate change finally comes to bite them on the arse!"*
>
> *"The face doesn't reflect greed and consumption but rather the effects of climate change, which is very effective. Its striking, thought provoking and encourages you to read the message and take heed."*

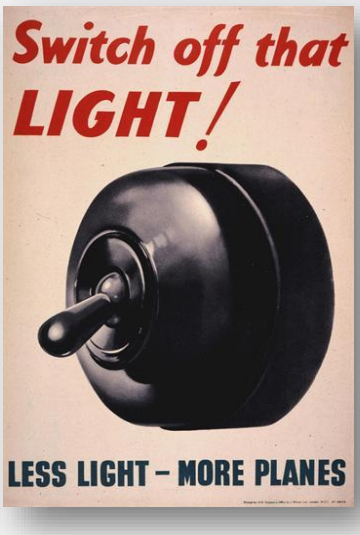
On greed and consumption, one respondent, a ninety-year-old WWII Veteran WAAF, Anne R Thomas (ne Wish), was compelled after viewing the poster, to describe a comparatively different way of living in 1940's London, when food restrictions and allowances went a long way to produce a healthier population. Everyone had "*fair shares-rich or poor*", which led to poorer families eating better than their forebears, and eating good healthy food, which many had not done before. She claims that everyone became used to cutting down on sugar and many other things and that it was no hardship. One could always substitute with other available commodities. Anne suggests that maybe the sensible food intake of the war years had a big hand in developing healthy, fit and so happier human beings, which is how she sees our older generation of today. However, she also makes observations about how so many people today are obese or very overweight and spend too much time inactive and over indulgent.

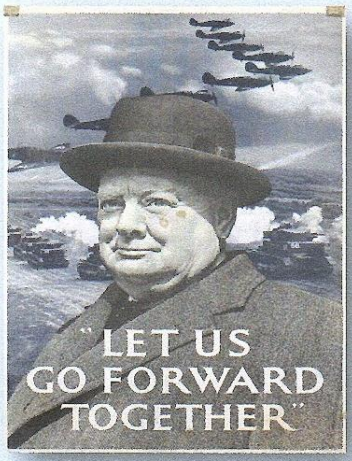
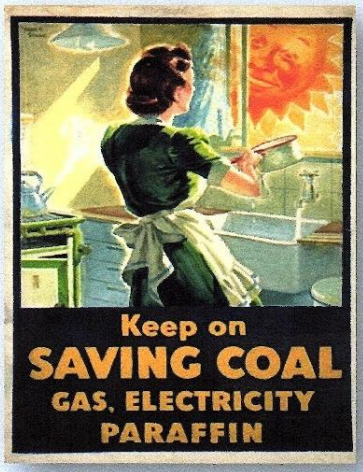
The point here is that a poster of this type offers opportunity, through creative thinking and sensitive design, to evoke response, stimulate debate and engage the public in a context which might normally be difficult to relate to. In other words, it has the potential to "*bring it home*".

Here are some examples of WWII Government Posters in Figure 5.6. together with observations by the artist author .

Fig.5.6. Examples of WWII Posters Examples No's 1-11

| WWII Posters 1940's Britain | | | |
|---|---|---|---|
| 1 | "Our carelessness, their secret weapon" Prevent forrest fires |  | These depictions of the enemy could be perceived as racist, today, however they convey the idea that the enemy is alien, foreign and dangerous, which makes them very effective. |
| 2 | "Together" |  | A sense of comradeship, pride and an organized and united front; interdependence and co-operation. |
| 3 | "When you ride alone, you ride with Hitler!" Join a Car-Sharing club TODAY! |  | In other words, if you are extravagant with energy resources, you are giving the 'enemy' the advantage – considered a TRAITOR!...and shunned by the community. It is both subtle and startling. |

| | | | |
|---|---|---|---|
| 4 | "HELP WIN THE WAR Squeeze in one more" |  | In other words, "let's be good citizens and make sacrifices, for the common good, so that we can all be safe and secure, in the future… and let's have fun doing it!" |
| 5 | "Better pot-luck (with churchill today) than humble pie (under Hitler tomorrow). Don't waste food!" |  | Offers the choice of 'co-operate or be conquered'. This is quite a complex idea, but essentially suggests that short term compromises, will help safeguard civil liberty. |
| 6 | "Switch off that LIGHT!" " LESS LIGHT - MORE PLANES" |  | The message is to conserve energy (resources), for the production of aeroplanes and munitions, to help us to fight for our freedom.. |

| | | | |
|---|---|---|---|
| 7 | "Let us go forward together" |  | This poster encourages the public to unite as one, and follow the leadership forward to victory. |
| 8 | "Keep on SAVING COAL Gas, Electricity, paraffin" |  | The housewife at her domestic chores, rewarded by the bright cheery sunshine at the window, suggesting that the more devoted we are at home as families to working hard and saving resources, the brighter the prospects and the happier we will be. |
| 10 | "SAVE Kitchen Scraps to Feed the HENS!" |  | This delivers a simple, clear message which suggests that waste food should be kept for hens. The characterisations of the hens adds humour and entertainment but at the same time, it does not need to make obvious why we need to feed the hens. The public make that connection by themselves. |

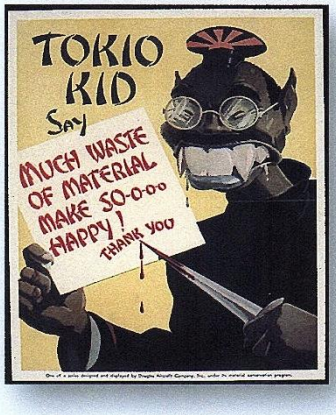
| | | | |
|---|---|---|---|
| 11 | Tokio Kid say "Much waste of material make soooo happy! Thank you" |  | It implies that careless use of resources will give the enemy an advantage. It suggests that the enemy will delight in our bad management of resources…and almost says "keep doing it and we will be very grateful! It appears that if we waste resources, our enemy will be more capable of doing away with us – hence the sword and the blood |

Image No. 5. "*Better pot-luck than humble pie"*, uses a characterisation that Britain relates to as being nifty and virile. The message has a sarcastic tone (in the use of "*thank you*") but is a prudent one which prompts the citizens to think ahead and be mindful of the potential consequences of their actions – the threats to their survival. It is not biased, nor misleading and applies psychological pressure on a practical level, and not a political one, within the context of war. The concept of assisting the enemy in gaining the advantage plays on the public's emotion of fear.

The cartoon style of these posters provides creative and intellectual scope for conveying important messages and influencing the public. They are evocative through humour and sentimentality and by suggesting a sense of patriotism, whilst being generally eye-catching and entertaining. Furthermore, they are not ambiguous in contrast to other types of visual art, and although there is scope for individual interpretation, they would be relevant to the pre-dominantly working-class society (Addison, 2010), as well as a broader demographic, e.g. the housewife, young family, single person, car owner (of which there were relatively few), office worker, soldier, executive male etc. Most critically, they deliver an important message which might not be as engaging and impactful if expressed in text.

## 5.4. Art of Climate Change

Since the 1960s when climate science started becoming more broadly publicised, the production and accessibility of climate change related images has grown. This is evident upon searching image banks online, although attempts to catalogue them chronologically, date them, understand their motive or identify their original author for citation proved problematic and time-consuming. Most images were found in multiple publications i.e. websites, and at different times. Phrases such as "*art of climate change", "climate change images", "climate change visuals"* and *"climate change impacts*" were used in the online search. One of the earliest images sourced for this study is a black and white photograph on behalf of Friends Of The Earth, circa 1980 (Fig.5.6. Number 6). The most recently dated image included is number 7 (EIDEARD, 2016).

The selection of images for this review, was chosen for - variety of subject, style and approach, however, this small sample is not representative of the climate change images stock, but provides a glimpse into the world of artistic imagery, (going beyond documentary purposes), which responds to one of our more recently experienced and ongoing human crisis.

Communicating the facts of climate change to affect decision-making and behavioural change are two of the most serious challenges of our era. Although there has been a lot of research about the visualization of climate change, research about the contribution of contemporary art to the topic has been scarce. One example of art-science in action from a research standing is found with Climart (launched in 2014). Cape Farewell, Climart's major partner, is a project created in 2001 by David Buckland as a cultural response to climate change. He believes that artists can engage the public in this issue, through creative insight and vision, and engaging artists for their ability to evolve and amplify a creative language, communicating the urgency of the global climate challenge on a human scale. Can visual art affect viewer perceptions of climate change? Closely related to this research project's aims is the question that lies at the core of the 4-year multidisciplinary research project which begun in 2014, "*can visual art affect viewer perceptions of climate change?*". Climart's international team of researchers in psychology, natural science and the arts is led and housed at the Institute of Psychology at NTNU, Trondheim, Norway. The research includes studies assessing how audiences are affected by climate-related artwork. Field data collection methods included eye-tracking, as a means of assessing visual environmental communication processing. Climart explores the underlying mechanisms involved in both the production and reception of visual art.

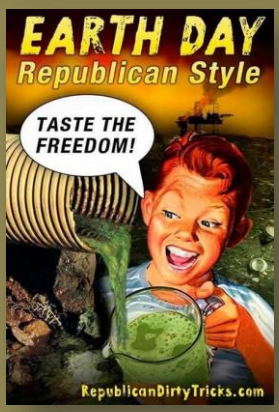
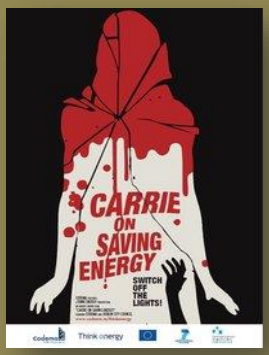
Another perfective suggests that when it comes to climate change, data visualization lacks a sense of passion, and that it presents facts and nothing more. The absence of bias or zeal lends strength and credibility to a good data graphic. On the other hand, whether we need a stronger, more emotionally based approach is a question also debated. One suggestion is to fuse data with art and bring back the emotional punch with some quantitative substance. Some artists have tried this, with mixed results (Montanez, 2015). This sounds rather like a recipe for a cocktail – a pragmatic one, which abstains from adding anything intuitive (speaking metaphorically).

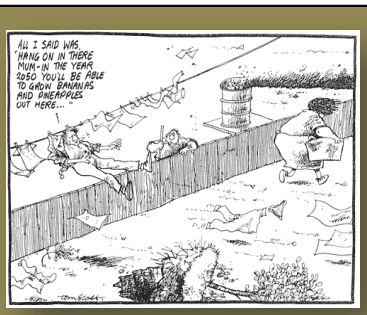
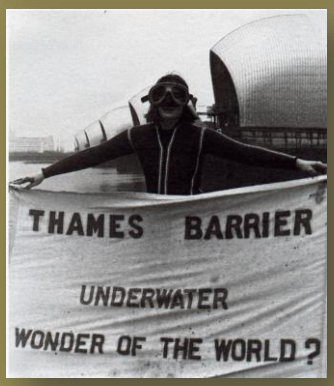
The comments made here are based on the researcher's subjective interpretation, providing a conscious reflection of this relatively new bi-product of climate science debate.

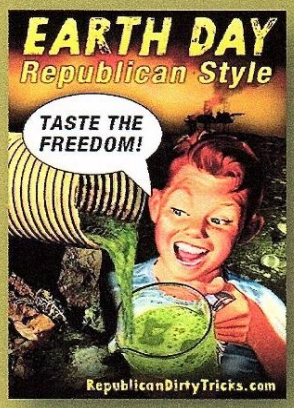
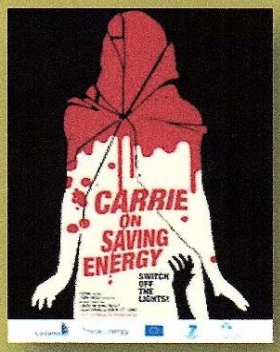
To compliment this review of climate change images, Chapter 6 examines the viewer responses to field experiment "Image Poll".

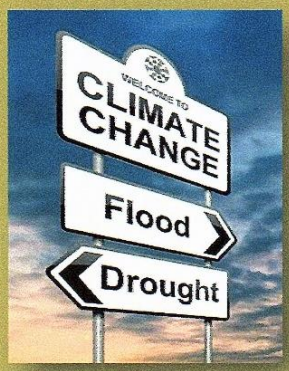
Please see next page for Figure 5.7. Climate Change Images:

Fig.5.7 Examples of Climate Change Images No's 1-15

| | | | |
|---|---|---|---|
| 9 | 'Postcards From the Future' London as Venice ©Robert Graves and Didier Madoc-Jones, aerial photograph by Jason Hawkes (2010) |  | This futuristic depiction of London "as Venice" is quite shocking and large scale but perhaps it needs a close-up too – with humans or animals in it. |
| 10 | New Security Beat (2010) |  | As panellists at three of the "Women Deliver" conference's climate-focused events noted, women in poor, rural areas are especially vulnerable to the impacts of climate change. The effects of the swirling winds and dry earth are captured best by means of painting. |
| 11 | West Virginia Water Crisis. – Pinterest republicandirtytricks.com |  | A sarcastic message, executed in similar style to WWII posters, but with a dark and negative aproach, designed to make the viewer angry at republicans. |
| 12 | Codema. Dublin City Council. |  | Just in time for Halloween, the Think Energy Campaign uses well-known Halloween Film Posters and adds an energy-saving pun to encourage staff to switch off the lights when leaving the office. The posters went up in Civic Offices on Monday, 21st October as part of Codema's energy awareness campaign which aims to inform and inspire Dublin City Council staff to become more energy efficient at work as well as at home. |

| | | | |
|---|---|---|---|
| 5 | Steven, Madeline, John G, Geetika 2014. New Zealand: Krazy Kiwis. |  | This comic strip is from the 1980s when scientists were confused about the occurrence of climate change and human involvement in it. |
| 6 | Friends of the Earth. ( 1980's) |  | Friends of the Earth local groups raise awareness about the impact of climate change and rising sea levels in the 1980s. |
| 7 | "The Oil Patch Boys have known about cliamte change since the 1980's" EIDEARD (2016) |  | Instead of cleaning up its act, Exxon waged a $16 million campaign in the 1990s to block proposed regulations on greenhouse gas emissions and to persuade the public that climate science was unreliable…It became clear in December that several major oil companies affiliated with API had early knowledge of climate change. |
| 8 | World Wildlife Fund WWF Belgium (2007) |  | This assumes we will evolve in time to survive. However, it makes for a nice quality portrait and the stylish shirt is a distraction from the potential disgust of having a fish head. From this point of view it conveys a more serious message as opposed to a fantasy one, perhaps. This image was a popular choice within the field research "Climate change Image Poll" experiment. |

| | | | |
|---|---|---|---|
| 9 | 'Postcards From the Future' London as Venice ©Robert Graves and Didier Madoc-Jones, aerial photograph by Jason Hawkes (2010) |  | This futuristic depiction of London "as Venice" is quite shocking and large scale but perhaps it needs a close-up too – with humans or animals in it. |
| 10 | New Security Beat (2010) |  | As panellists at three of the conference's climate-focused events noted, women in poor, rural areas are especially vulnerable to the impacts of climate change. The effects of the swirling winds and dry earth are captured best by means of painting. |
| 11 | West Virginia Water Crisis. – Pinterest republicandirtytricks.com |  | A sarcastic message, executed in similar style to WWII posters, but with a dark and negative aproach, designed to make the viewer angry at republicans. |
| 12 | Codema. Dublin City Council. |  | Just in time for Halloween, the Think Energy Campaign uses well-known Halloween Film Posters and adds an energy-saving pun to encourage staff to switch off the lights when leaving the office. The posters went up in Civic Offices on Monday, 21st October as part of Codema's energy awareness campaign which aims to inform and inspire Dublin City Council staff to become more energy efficient at work as well as at home. |

| | | | |
|---|---|---|---|
| 13 | Climate Change Toolkit |  | A very simple idea and an effective execution, which sums up climate change impacts succinctly. This image is easy to recall, describe and repate. |
| 14 | Banksy (2014) |  | Graffiti art from Banksy is seen on a wall next to the Regent's Canal. Reuters/Luke MacGregor – Sourced on The Guardian website This type of image speaks for itself but requires a degree of solving by the viewer. |
| 15 | "Waiting for climate change at Beaufort" Isaac Cordal (2014) |  | Miniature clay figurines stand passivley on Flemish beaches "waiting for climate change". It is an eyecatching art installation which challenges our perceptions. |

The first image included here (No. 1) is an example of hypothesis set in an urban environment. Despite the negative scenario of flooding, it has a positive feeling of adaptation and resilience and survival through the placing of a character, perhaps a heroine, in this fantastical but ironically realistic idea of climate change outcomes. Image number 2 is also hypothetical, and uses iconic symbols in beautiful and almost biblical way, stirring our senses of curiosity and a desire to piece-together the story. The next image (No. 3) in contrast, is dark and disturbing, and plays on our conscience and nurturing instinct by means of the vulnerable child looking back at us with a pleading expression. Cartoons can be effective, even when they are without

humour, as this compact composition in image number 4 illustrates, with its unspoken "*look what we're doing to ourselves*" dialogue. The 1980's cartoon (No. 5) is both humorous and cynical and makes a mockery of the idea that humankind is complicit in having anything to do with the onset of climate change. It is simplistic and controversial. There is evidence of environmental campaigning and attention-grabbing in both image numbers 6 and 7, however, the more recent digitally manipulated photograph by WWF in 2007 (No. 8) grabs attention with the fictional visual that warns of personal physiological changes beyond our control. It is well designed to be repulsive and attractive (fashionable shirt) at the same time. The second digitally manipulated photograph (No. 9) is visually impactful and perhaps amusing but is devoid of biology – no plants, animals, birds or human life. For this reason, one might suggest that is difficult to connect with and relate to.

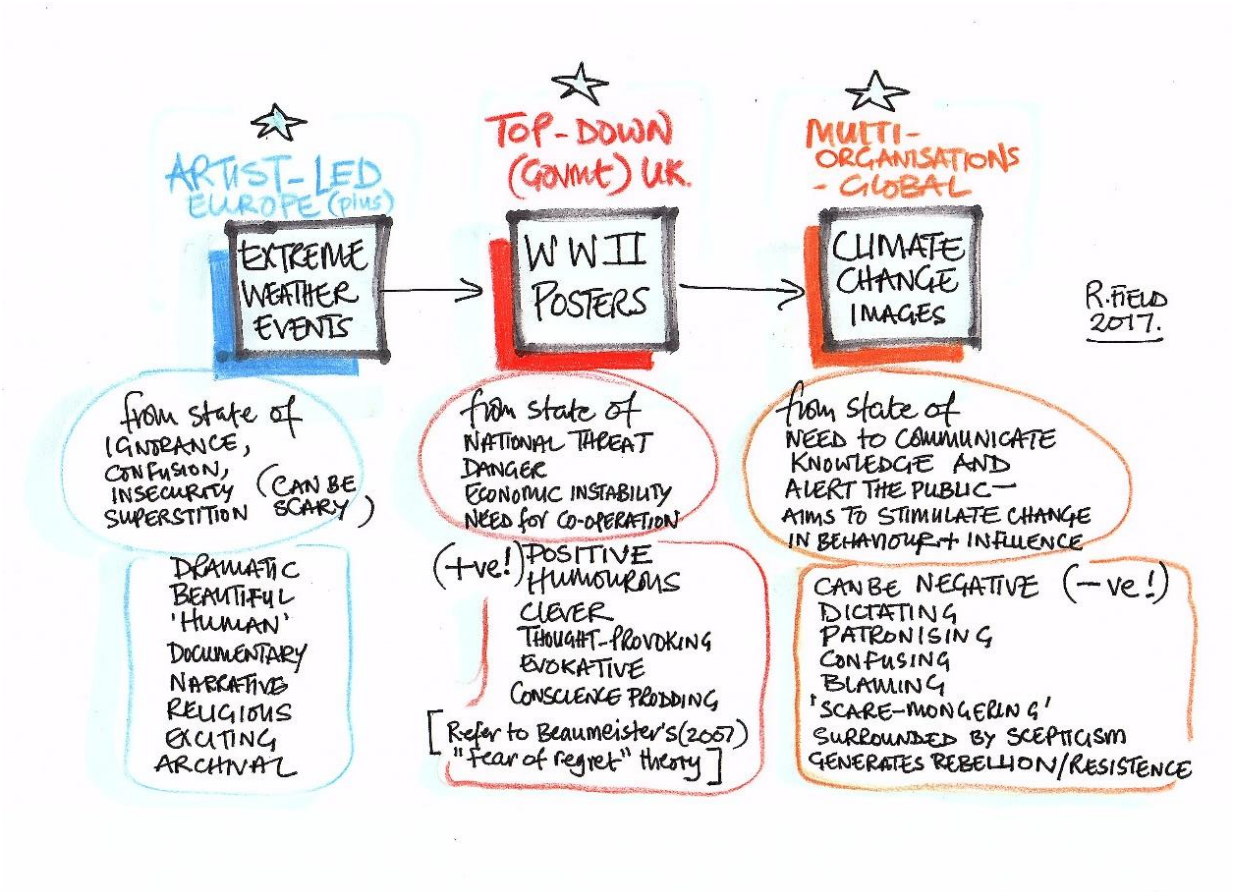
A good example of artistic conveyance and story-telling is seen in image number 10. It contains dynamic movement and a climatically atmospheric feel. It helps to humanise the crisis and the effects on the ground so to speak, of communities in developing countries, in this case – women in rural areas. Image number 11 is a poster reminiscent of the style of WWII Posters. It has a sarcastic tone, evokes anger and conveys the irony of being promised freedom at the cost of pollution, and ill health. A play on words is used in image number 12 with the use of theatre and the character form a well-known horror film. One potential weakness in this design is that it is dated and therefore only a limited age-group might understand and relate to it.

The formulaic design of image number 13 is simple and visually impactful, effective in its message, and has the potential to be understood by a wide public audience. The final two examples are categorized as art installations. Number 14 is conceptual and uses irony with a message depicted cleverly using the visual, which is relatively easy to engage with. In the second of these examples (No. 15), the meaning is more ambiguous, however, at the same time it has an almost journalistic feel and the apparently struggling part-submerged figures, in a vast landscape of soft, wet sand make it eye-catching and impactful. One's immediate impression stimulates a reaction and makes us question what exactly we are seeing. Importantly, both images rely on photographic technology to capture their art installations, and share them with the world.

## 5.5. Summary

Three examples of the application of art at times of human crisis have been reviewed in this chapter, and consideration given for their public purpose, style and effectiveness. Each crisis examined has provided different motivations for production of visual art, at critical stages in modern history, and therefore is associated with different characteristics. Figure 5.8. summarises these motivations and characteristics.

Fig.5.8. Art of Human Crisis Motivations and Characteristics between 15th and 21st Centuries. Field (2017)




Looking at the small selection of climate change images presented in Fig.5.6, it is evident that many and varied approaches have been taken in the quest to convey the message and engage the public and the whole of society. They include graphic designs, cartoons, digitally manipulated photographic images and an art installation. When it comes to medium, the question of whether fine art drawn or painted by an artist's hand (mouth or foot) is more effective than photographic fine art remains the subject of debate, with some holding the view

that there is no difference between the two. Defining the difference between the mediums is problematic, but as one respondent suggested within the field research, an artist puts something of her/his heart and emotions into a painting, for example, whereas a photographer, whilst being able to input a creative element, is constrained by environmental conditions, equipment and technology, and cannot paint her/his emotions into the image. This challenging philosophy is worth further discussion.

It is evident that visual art has played a significant role in relation to periods of adverse meteorological conditions. This study has involved a conscious selection of images that make interesting examples of the development and scope of extreme weather depictions by artists. There are many more in existence and worthy of acknowledgement. What stands out is that art has no boundaries and limitations when it comes to possibilities, especially in modern times. Artistic creations are often beyond any expectation or speculation that could be made, and the uniqueness of the individual artist is key to this. However, no artistic creation can be valued without the unique subjectivity of the individual viewer. This is collaboration on the ground.

This chapter has reviewed the art of extreme weather events through periods in history when the public had limited or no understanding of the climate science. It is suggested that art created during this time had several functions, that is to record and illustrate the events, to hypothesize on causes and attempt to explain these unpredicted natural events to the public. But further to these more practical functions there is the beauty and mystery and the humanizing of these periods of extreme impacts upon daily life that creative artworks bring to a world trying to make sense of their experience. Today, we can look back in time at the masterpieces and acknowledge the public's state of limited knowledge. One is reminded again of Rodin's claim that art is the sublime mission of man, trying to understand the world, and making the world understood. Within the limits of our anthropocenic understanding of the causes and longer term effects of climate change, Rodin's suggestion that great works of art help us to understand that there are things that we cannot know, takes on new relevance.

The posters of World War II are clearly designed to influence behaviour in a specific way, by using recognisable symbols and icons that target audience - the public can relate to, for example the housewife in her apron, caricatures, military uniforms and items of everyday living. These were top-down, highly creative and cleverly contrived compositions of both objects and slogans, which often relied on humour and novelty factor to convey serious messages. Unambiguous in their meaning, they were highly impactful visuals with a purpose. And just

like a good joke amongst friends, they communicated in such a way as to make them easily sharable. In other words, the poster's visual and textual content could be quite easily re-iterated to friends, work colleagues and family.

However, eighty years later, and faced with the threat of climate change impacts, it seems that a directly challenging slogan such as would have been used during times of scarce resources in the 1940's "*is your journey necessary?*" might be considered imposing and an infringement of personal freedom, and yet it is unambiguous and succinct, and addresses the issue in hand. Perhaps this is the area of public engagement which needs examining.

Having reviewed hundreds of climate change images online, the overall impression is that some of the most thought-provoking art which can be related to extreme weather events and climate change, are the ones which depict the impacts that have not yet occurred. Being imagined and not factual, they offer scope for the most liberated creative thinking. When unhindered by society's expectations to accurately depict what is - or has been, prophetic and fantastic art has the scope to be daringly predictive of our future. It may lead to the discovery or recovery of human ingenuities. It could help us to explore previously un-experienced scenarios and their implications, within a world of changing climates, to make more informed decisions about the survival of humankind.

A dialogue between artist and scientist might start with "*imagine if…*" It is doubtful that simply showing how a landscape might look different, if it was a metre underwater, is going to launch the public into taking mitigative measures in the face of climate change. However, by exploring the potential knock-on effects to the lives of people, resulting from the changed landscape, from both practical and emotional (psychological) sense, in a visually-imaginative way, there might be a chance for a significant shift in behaviour. This review of the art of human crisis certainly suggests realistic potential.

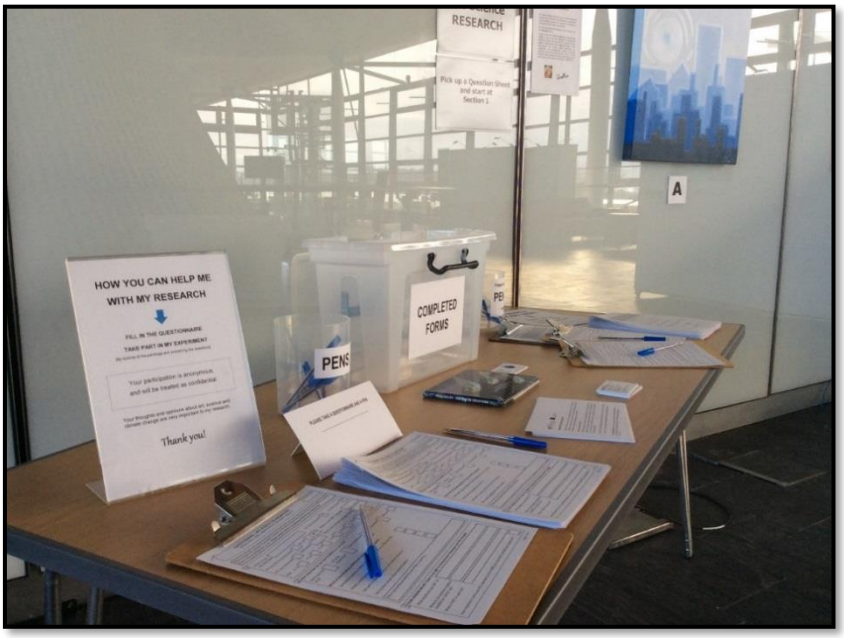
# CHAPTER 6: Public engagement with art-science

How the public engaged with visual art in the form of paintings and drawings within a science context of climate change impacts.

## 6.1. Introduction

Whereas Chapter 5 offered a mainly speculative view of public engagement with visual art related to specific times of human crisis, this chapter discusses empirical evidence of the different ways in which the public have engaged with art-science within the field research activities. These are categorized as expression of opinions, subjective interpretation, relating and emotional connection, problem solving, compositional impact, casting their vote and through imagining and drawing. Figure 6.1. documents the set-up of tools and equipment for the field research activities accommodated at the Senedd, the main public building of the National Assembly for Wales in Cardiff.

Fig.6.1. Field research conducted at the Senedd, National Assembly for Wales, Cardiff, 2014



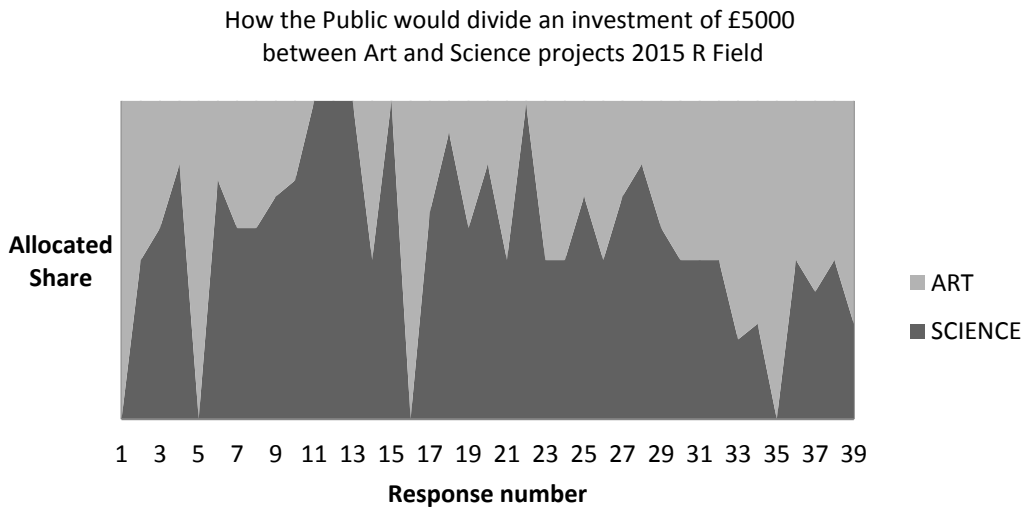

Overall, throughout the field research activities in all locations, it was found that the public engage with art very willingly and imaginatively, with a clear contribution to make towards change. The public have much to offer through engagement with a collaboration of art-science. This offering is possibly where the potential lies for change and adaptation, and is explored in Chapter 7: How does public engagement with visual art within a context of climate change

hold potential for behaviour change and adaptation? The science context referred to here is environmental, and climate change related. Field research questions and images have been designed with this context in mind. This field research has shown that the public, young and old, are ready and willing to engage with art, and especially art which lends itself to interpretations around climate change themes.

When it comes to beliefs and attitudes, the indication is that there is an almost equal commitment to art and science, swinging marginally in favour of art. Participants being asked to decide how they would allocate an investment of £5000 between science and art, did so as follows: Art 53% and Science 47%.

Figure 6.2. is a graphic representation of how individuals split their commitment to art and science. For example, respondent number 5 allocated the whole of their £5000 investment to art, whilst 11, 12 and 13 allocated it to science. Respondent 31 was amongst several who said they would split their investment equally between the two. This graph layout was chosen because it helps us to see how committed the public are in principle to both art and science, and by representing the data in this way, we can easily see where the public have committed 100% of the investment in one direction or the other, i.e. to art or science.

Fig.6.2. Public commitment to art and science projects.




Through field research activities, respondents articulated themselves in words via the questionnaires, by choosing images within the “Image Poll”, and by drawing climate change. A selection of responses has been included here as examples, however examples of data can

be found in the appendix. It is evident that overall, there is a commitment to art as a catalyst for discussion, and an opportunity to turn ideas into action. The responses included are just a few examples of many which relate to the unique contribution that art offers, which goes beyond illustration and a method for explaining science knowledge.

## 6.2. Expression of opinion

Within the questionnaire, participants were asked if they believe art can influence the public's decisions about how they live. Their responses were mainly positive. The table below provides examples of the kinds of responses received.

Table 6.1. Qualitative responses - An indication of public opinion. Examples of responses to the questionnaire regarding the influence of art within their lives.

| |
|---|
| *(a) "I think so, by depicting a message evocatively, inspirationally"* |
| *(b) "Yes, it holds a mirror up to show us how we are"* |
| *(c ) "I think so. It inspires them and allows them to express themselves"* |
| *(d) "Yes, art can help us understand how we view the world and how we choose to live. It can help us express and explore ideas about our own culture. It promotes social engagement and cooperation"* |
| *(e ) "Art can create realities that transcend the actualities of situations. Bird-watching books tend to use drawn illustrations rather than photographs of birds to help people learn to identify birds; this is because a drawing collates all the key salient features of a bird. In the same way, all art can bring together the key features of a situation in a clearer way than facts. "* |
| *(f) "You tell me – there is no one way. But just as the court jester could say things that even the leading Barons would not dare, art and creativity can help us see our blind spots and prejudices, and imagine a world, as-yet unseen so we can then make it real." "…it's about seeing things through a different lens…the artist's eye…"* |
| *(g) "It's about giving people a window"* |

In summary, these examples (Table 6.1.) suggest that the key facets of visual art within climate change engagement are that it is evocative, acts as a mirror, can inspire, provide a different lens or window through which to view the subject, and is made possible by means of the "*artist's eye*". In addition, it appears that the public consider art to be a catalyst for enlightenment, self-reflection, and expression. Ideas on art's role within climate change adaptation were offered by under-eighteen-year olds in group discussions.

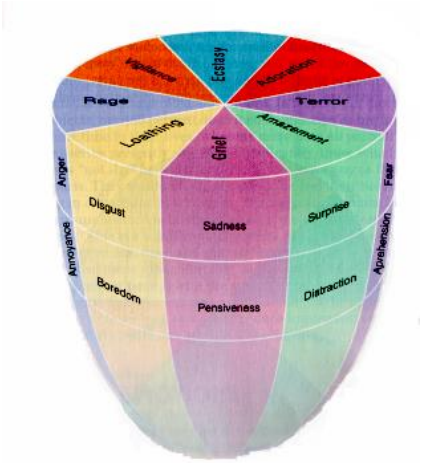
Examples of typical responses by under eighteen-year-olds, to what difference it can make to look at paintings when thinking about climate change have been selected below:

> *"I think having art that provokes people to talk about it and say what they feel. Text would be point blank fact, but art is open to interpretation."* [age 13-18yrs]
>
> *"You see the art and it sparks the imagination and then people can imagine what the future might be, and that realization could change their attitude."* [age 13-18yrs]
>
> *"Yeah…coz it shows how the artist is feeling at the time when they have the information from science, and then that is what the artist thinks is going to happen. It shows how people feel." "We should make paintings bigger and spread them"* [age 16yrs final GCSE Art pupils]

The reoccurring message in both adult and under-eighteen-year-old's responses is that art helps the public to feel something. This could be the first stages of a process towards acting. Furthermore, the impression is that they support the idea of making use of this type of medium for provoking the public to talk about the subject and to act as a catalyst for sparking the imagination, so they can visualize the future and change their behaviour accordingly.

In the last several decades, advances in theory and research within development psychology have produced profound changes in the ways in which we understand human action and development. The elements and contexts of human activity cannot be understood independent of each other. Instead, human development occurs in medias res – in the middle of everything. When taken seriously, the implications of this idea are vast. Instead of operating as separate modules, thought and emotion; experience and action; biology and agency, person and environment; and other ostensibly opposing processes, are highly dependent upon each other. A recurring theme that has emerged in developmental theory and research over the past several decades is the profound lack of independence of the systems that make up human action as well as the systems and contexts within which human action is embedded (Mascalo & Fischer, 2010). Furthermore, interpretations that people make of an event, during the process of self-talk, determine feelings (Pearson, *et al*, 2002). It sounds obvious but how a person self-talks their way through interpretation of an event will determine their emotional response to it and thus how they decide to react. Pearson et al., 92002) explains that the two types of emotions that result from self-talk interpretations are facilitative emotions that contribute to effective functioning, and debilitative emotions that prevent a person from functioning effectively. His model seen on the left in Figure 6.3. shows the importance not only of choosing the right emotional family when expressing yourself, but also of describing the *strength* of the feeling.

Fig.6.3. Choosing the right 'emotional family' when expressing yourself




Providing art can bring about a shift, and increase the strength of feeling within a set context, it might also motivate the public to be proactive in bringing about change.

Model above: Copyright © Thomason Learning, Inc.
Extracted from Pearson *et al*., (2002); Powerpoint Presentation

Let us suppose that facilitative emotions are associated with Approach (Gray, 1990) and Toward (Charvet, 1997) behaviour, whereas debilitative emotions are associated with Withdraw (Gray, 1990) and Away From (Charvet, 1997) behaviour. What we are alluding to here is that the public will tend to be emotionally moved in one of two directions by their subjective interpretation, which in turn, has the potential to influence consequences in terms of reaction and action. Therefore, if strength of feeling (Pearson, *et al*., 2002) that brings about a facilitative/approaching/toward response can be heightened, through art-science, perhaps this will boost confidence and assertiveness, within climate change adaption.

## 6.3. Subjective interpretation

The set of four paintings in Figure 6.5. was used to collect data in two different ways, within an exhibition displayed a seen in Figure 6.4. as one of five sections of experimental field research, and for group discussions within secondary school class rooms. Engagement by the public was observable throughout the time of exposure to the paintings, and can be described under several headings. This empirical analysis provides some measure of the opportunity for art when shared with the public in this way. In other words, this is a summary of what happens when the public are asked to be proactive in viewing and expressing thoughts and feelings for artistic images with a suggestion of a climate change context.

Engagement during the experimental exhibition provided written responses, by adults, to the questions of (a) what is the story, and (b) how does it make you feel? The resulting analysis is a summary of responses. Note that participants carried out this task individually and not as a group. Of particular interest is how distinct the four sets of feelings are. Table 6.2. summarises the most common responses.

Fig.6.4. Section 3, field experiment exhibition, the Senedd, National Assembly for Wales, Cardiff, 2015


Fig.6.5. Section 5 Experiment: Set of four images

A B C D

Table 6.2. Responses to interpretation and associated feelings: Experiment Section 5.

| **Image** | **Participants' interpretation (story)** | **Associated feelings** |
|---|---|---|
| A | Coastal erosion, family is made homeless, child has left teddy behind. | Sadness, pity, sense of loss, and regret |
| B | Fire-fighting, oil slick, bravery, fire onboard ship, flood, grave stone, or gas. | Concern, pride, comfort, reassured, community. |
| C | Religion, community, superstition, mystery, God | Scared, confused, home, spiritual, curious. |
| D | Pollution, industry, war with nature. | Disgust, anger, dismay |

Furthermore, these results indicate public perceptions of which image conveys the biggest potential threat both locally and globally – painting D (Table 6.3.). Whether the response is scientifically accurate is unimportant here. What this demonstrates is that the public are engaging with (and contributing to) the debates around climate change, through unique, creative artwork, subjective interpretation and articulate expression.

Table 6.3. Section 5, Stage 2: Experiment – Local versus global.

| Four Scenarios<br>WORST IMPACT | Image<br>A | B | C | D |
|---|---|---|---|---|
| LOCALLY | 8 | 10 | 7 | 34 |
| GLOBALLY | 8 | 9 | 2 | 39 |

These results are reinforced by the qualitative responses by under-18-year-olds in group discussions, to the same set of paintings. The following examples in Table 6.4. demonstrate engagement by the viewer, evidenced through verbally articulated story-telling which required some degree of speculating, imagining, decision-making and concluding, relating, curiosity, empathizing, hypothesizing and expressing feelings.

Table 6.4. Selected responses by under 18-year olds to Section 5 images in group discussion

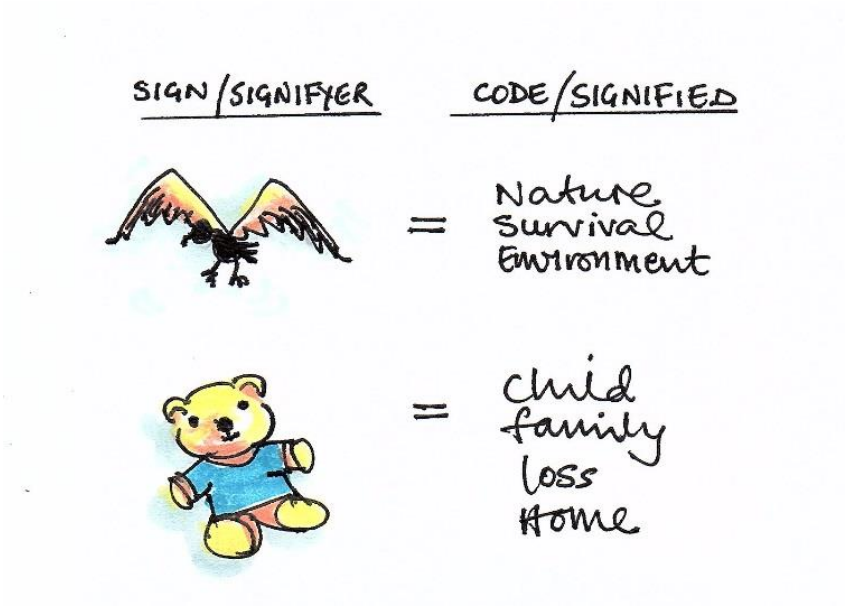
| **Fig. 6.4: Selected responses by under 18-year olds to Section 5 images in group discussion** | |
|---|---|
| | **Painting A: [Coastal erosion and undermining of homes]** |
| A.1 | "High tide, house falling off the dunes, sea has been rising and taking houses out, teddy bear suggests a child was living there and now it's homeless, the bird could be losing its home, pylons falling down, house in distance has sunk, stormy skies." |
| A.2 | "A falling house; a kid died…there's a teddy so maybe the kid got out and dropped the teddy; is it the waters come along and washed the ground away? A tsunami. Water left the ground soggy and it collapsed like a mudslide." |
| A.3 | "I feel sad; I like the colours of the picture; makes me feel lucky about where I live – grateful; feels like there's tension; flooded…from global warming and ice melt, sea level rise; it looks weird coz there's no-one in the house – it's confusing; abandoned; disappointed that it happened." |
| A.4 | "It's a house on the beach; coastal erosion; there's a child in the story because of the teddy; rising sea levels; they tried to run away; it could be saying that global warming is destroying children's childhoods; the child has been lost to the sea and the house is going to follow; wildlife (the bird) shows that it affects everyone…the bird is a reminder that it has a wider effect." |
| A.5 | "I feel sadness because of the child and the teddy; shame because we have caused it; pity; concern for the family that actually lived there…" |
| | **Painting B: [Fire-fighting]** |
| B.1 | "Intrigued; happy because it's hot; scared; worried for the firemen; there's water there – firemen are standing in it; or it's an oil spill; I feel grateful to the firemen; maybe the firemen are sad and one of their friends is in there (the fire)." |
| B.2 | "yes…we are talking about bravery; there's a sense of beauty because of the fire. It's ironic that fire, what we live by, can also kill us." |
| B.3 | "It's got so hot that things are burning; climate change has increased the sun's heat; grass fires; firemen look like they're standing in water, but it doesn't look natural; tanks look like gas tanks so it could be a gas factory on fire; it looks like a gravestone so it could be a church that's on fire." |
| B.4 | "I feel sad because people have to deal with it so I also feel grateful." |
| | **Painting C: [St David's Cathedral Underwater, with kelp]** |
| C.1 | "Could you say that people could be quite ignorant and say that God is looking after them and so we don't have to worry about climate change?" |
| C.2 | "It looks like that place is very dry because plants look like they're wilting; I think the sea has come up so high that it's flooded the church; It looks stormy because the plants look as though they're being blown; it's dark and gloomy; it could be a portal into another world; an apocalypse…because it looks like something's happened and everybody has turned into something else and people have turned to god; the plants don't look familiar, climate change might have led to plants changing and being different to what they are now." |
| C.3 | "I feel confused, clueless, curious, anxious, spooked, depressed." |
| C.4 | "It's more detailed; worried about the future generation, (it could be us), colours make it look more fantasy; I don't think its fantasy – it could be real; it could mean that there's a glimmer of hope because the lights are still on in the cathedral; it's symbolic of life; colours are bright and happy but I get a sadder feeling." |
| | **Painting D: [Smoking industry, windfarm and crow]** |
| D.1 | "It's a factory; it shows the main problems of climate change – gas in the air; on the right it looks like a wave it coming over factory; it looks bare and deserted – old wire fence." |
| D.2 | "You could argue that on the one hand you've got the factory spewing out pollution…then you've got the windmills trying to create renewable energy source – the two sides of the argument." |

| | |
|---|---|
| D.3 | "I think D could be 'our fault' or 'people's fault' because we've built the factory and polluted the area and the environment." |
| D.4 | "Maybe D evokes the strongest feelings because it's like a constant battle between nature and science. As the years go by pollution and the factories overpower nature and people forget that nature was here first." |
| D.5 | "I'd say D is quite frightening - because we have made an effort to develop energy in a sustainable way, and yet we still rely heavily on heavy industry and we're still creating pollution for things that we take for granted like fuel etc." |
| D.6 | "It puts into perspective that we're probably not doing enough to change the way that we're treating the environment around us." |
| D.7 | "Looks like there were also sheep trying to get out of the field – see the bits of sheep wool on the barbed wire fence. Crows are dark and evil and give you the feeling of bad. The factory looks like a ship on the horizon – could be high sea levels." |
| D.8 | "I feel threatened, confused, annoyed." |
| D.9 | "Pollution from chimneys make me sad, but windfarms make me happy – because there's balance; I feel sad because the scenery is being ruined; heaven and hell – the left hand side is hell because it's dark and fire – on the left hand side it's heaven but it's more hell than heaven; disgusted – they try to make a living but they won't be able to much longer because of the pollution of the air; at the bottom of the hill is the factory but as they go up the hill towards the windfarm they are evolving; shocked, disgusted" |
| D.10 | "It looks like people have been evacuated – it looks empty; war – pollution is attacking the windmills (they are obscured by the smoke) and so the windmills are attacking the pollution – (a battle between them); there's a bird…there's a bird in each one…is it a crow?" |
| D.11 | "That's really realistic; very good details; it's sad because that has actually happened; diabolical; it looks evil – because of the black and purple; the crow looks tatty; pollution is coming out – everything is a harsh, harsh message; there's a big rabbit head and horse in the smoke in the sky; the blue in the sky behind the smoke is there to remind us of the contrast – false sense of security; there are windfarms – perhaps it says there isn't any hope even though there are windfarms; it's saying that we've discarded that method already (windfarms); there's still white wool on the fence so it shows that it was farmland and they had to move out; it sends a strong message – (only three of them said they would want to hang this painting on their wall). Painting A has calm colours which would be easier on the eye but has a dark message." |
| D.12 | "It makes us sad and guilty." |

From the responses and interpretations to these four paintings, it appears that certain details within them could be said to act as signifiers, i.e., if applying Semiotics theory (Saussure, 2011). Semiotics is the study of signs and codes, signs that are used in producing, conveying, and interpreting messages and the codes that govern their use. In communication, meaning is derived only to the degree that the receiver of the message understands the code. Saussure (2011) describes semiology as the marriage between a sound or image – called a signifier (Sr) – and the concept for which it stands (or content) – called the signified (Sd). Researchers in semiotics come from varied areas such as communication, linguistics, anthropology, field study, literature and marketing, as well as the natural sciences (Smith, *et al*., 2011). However, within this field research there is no code as such, only an artistic composition of objects or content with the potential to stimulate subjective interpretation and individual meaning-making

e.g. the blue teddy and the soaring bird of prey. In other words, whereas the artist will have ideas for the story or meaning of these objects (as symbols), they are not intended to signify any one set meaning for the audience. In this case, the objects merely serve to raise questions in the mind of the viewer. Semiology is useful as a method for analysis as it can help us determine cause and effect as well as help us understand how the public relate to specific content within a visual. Furthermore, where the audience connects more than one object within the visual to construct their story, we develop an awareness of how the public's environment takes on meaning for them as individuals.

Fig.6.6. Content extracted from visual in Section 5. Field Experiment observations




.

For example, it was found that the blue teddy in painting A shown in Figure 6.6. signified the absence of a child. Additionally, because the teddy is lying on the ground and there are no humans in the scene, for participants it signified loss, homelessness and lost childhood. The bird hovering above the teddy in painting A, also the bird in painting D landing on the fence post, signified nature and the concept of the wider effect of such events. It seems to act as a reminder of the bigger picture. Painting C's fire-fighting was a reminder of the irony of depending upon and at the same time being threatened by nature's fire, while participants recognized the juxtaposition of Painting D's opposing (or competing) elements, that is the traditional polluting industry and the windfarm on the hill, comparing them with "*heaven"* and "*hell"*. Black smoke contrasting with the blue sky behind it was said to be a reminder of stark contrast and a false sense of security. This was interpreted as a two-sided argument, a battle

between the two technologies and the need to evolve. The traces of sheep's wool stimulated speculation that whereas once there were sheep subsisting in this environment, now they had fled. Similarly, and according to responses, the cathedral in Painting C signifies ignorance, complacency and turning to God for protection. The lights in the cathedral windows signify hope and are symbolic of life, although participants expressed feelings of unease, confusion and sadness. Perhaps it can be interpreted as representing the vulnerabilities and co-dependent traits of humankind. Whatever interpretation or story put forward, these artworks were evocative and stimulating within the context of climate change.

Some participants were so enthusiastic in their engagement, that one proactive pupil burst forth and shared them vocally with the group:

> *"I have a massive theory!...this house has a bird – that is a bird (points) – that house is on the edge of water – there's a fire on the edge of water – then this is built out of stone…under water – all a relation to water – then, no water but smoke and fire, again – all related – theory!"*
>
> *"The bird is about life and death. There's no human life in these paintings apart from the firemen who are fighting life and death. Climate change is therefore about life and death. If we are the future then we need to stop climate change and save lives."*

This participant attempted to solve what he perceived as a puzzle or riddle, by connecting clues within each one to arrive at an answer, almost as if solving a Math equation e.g. "A+B+C (-D) = X" to arrive at the ultimate solution. For this young participant, the bird is thought to represent life and death…and therefore climate change. This interpretation of the ambiguous artworks was made by an exceptional individual who was confident in his address to the class and enthusiastic to share his speculations with his audience. One could suggest that this individual demonstrated leadership qualities, and that his persuasive presentation of the story might have the power to influence others within a group situation. The artist acted as a catalyst for joined-up thinking. This young participant showed potential as an effective collaborator through his creative thinking and proactive behaviour.

The response to painting B is curious, particularly the reference made to community, pride and reassurance. The overall impression is that this painting has a predominantly positive emotional impact, despite its story. This painting represents the instinctive attraction of fire for humankind juxtaposed with danger. Fire sustains life, and yet there is juxtaposition between the fire's life-giving and life-taking qualities. It represents challenge and the risk of defeat, and yet the focus by participants is evidently an optimistic one. There is a subtle expression of confidence in the

capabilities of humankind (in this case – men in uniform) to protect them. Gratitude, concern and empathy are expressed by school pupils in relation to painting B.

Painting C evoked a sense of curiosity and a cautious approach to interpretation, most likely because of its suggestion of something mysterious and unfathomable. It is an *underwater* scene that brings landscape and seascape together in the same scape, although this is not obvious without close inspection. The dark, leaning cathedral is depicted with its lights on, suggesting there is a congregation inside, which challenges logical thinking. Evidently, societies for underwater technology and sport currently exist; however, human underwater communities are currently non-existent. One school pupil interpreted the lights on as a message of hope.

Returning to the question of how different emotions or feelings can affect motivations, this study proposes a speculative translation in Table 6.5. For example, when paying attention to associated feelings, there is a stark contrast between A – *sadness, pity and regret*, and D – *disgust, anger and dismay*. Consideration is given to what state of mind the public may have been expressing, and what these feelings might represent in terms of cues for action.

Table 6.5. Proposal for the translation of a distinct set of emotional conditions.

| | |
|---|---|
| A | Sadness, pity, loss and regret = *Grief…empathy for conscience*? |
| B | Pride and a sense of community = *Resilience…for endurance and survival?* |
| C | Fear and confusion = *Insecurity…a need for governance*? |
| D | Anger and disgust = *Protest…public voice?* |

Presuming that emotion has the potential to motivate, one could explore which of these emotions, or perhaps combination of emotions, might prove effective. There are several theories within psychology that explore emotion and behaviour (Gray, 1990; Baumeister, *et al*., 2007) which help inform the analysis and interpretation of these results, and contribute to the discussion. For example, neurological research with animals suggests that emotion and

cognition systems in the brain overlap, which make it impossible to distinguish between them. Section 5 of the experiment attempts to separate the thinking and reasoning from the feeling, through subjective interpretation. That is not to say that there is a clear separation between the two, however, respondents' textual descriptions allow us to analyse how they engage with the images on a rational and emotional level. Gray's (1990) model assumes three fundamental systems: behavioural approach, fight/flight, and behavioural inhibition. Gray's (1990) behavioural inhibition response could be compared with the response to painting A – sadness, pity, loss and regret, and therefore the translation of "grief" and a predicted withdrawal or inhibitive behaviour. Along these lines, painting B's response of anger and disgust, could be compared with Gray's (1990) behavioural approach as participants tended to be expressive and voice their discontent as if protesting, and suggests intentions to be proactive. If painting B's responses translate as a sense of efficacy and confidence (potential resilience), this too might be associated with behavioural approach, and painting C's responses of fear related to fight/flight.

Similarly, the social psychologist's view (Baumeister, *et al*. 2007) is that emotion has the power to shape behaviour through anticipation of regret and as a feedback mechanism. It is argued that emotion does impact behaviour, usually indirectly, but can hamper cognitive processing. For example, an emotion of anger can lead to the expectation of a person being cheated, more than an emotion of sadness. Furthermore, the anticipated emotion associated with regret is powerful in relation to decision-making behaviour. Behaviour is understood as pursuing emotion as a desired outcome, and the anticipation of certain emotions can lead to caution and choosing the safe option. In this way, emotions function to provide feedback. This challenges the popular belief that fear causes fleeing and thereby saves lives (Baumeister, *et al*. 2007). Furthermore, this empirical research finds that emotions such as anger and pride are empowering and can be productive, whilst fear and sadness (and regret) are demoralising and more likely to lead to withdrawal and apathy. These conditions are relatable across all humankind.

## 6.4. Emotional connection and relating.

Table 6.6. How respondents selected options to describe their emotions

A

B

| | A | B | | A | B |
|---|---|---|---|---|---|
| | Cool | Warm | | Cool | Warm |
| 1. Hopeful, optimistic | **37** | 22 | 2. Positive, passionate | 21 | 28 |
| 3. Calm, reassured | **55** | 8 | 4. Scared, anxious | 12 | **31** |
| 5. Annoyed, frustrated | 9 | **29** | 6. Helpless, confused | 13 | 19 |
| 7. Nothing (no feelings) | 11 | 7 | 8. Other | 2 | 5 |

For this section the artist experimented with two colour palettes – cool and warm (Table 6.6.), to explore theories on colour and human emotions (Goethe, 1810), the suggestion being that different colours stimulate different behaviour in the receiver, or viewer. For example, Goethe proposed that colours from a palette of reds/pinks were positive and attractive, whereas a blue palette evoked negation and repose. These theories have been further experimented with and applied in the field of commerce for marketing purposes, as it is widely recognised that colour has an influence on consumer behaviour (Singh, 2006; Aslam, 2006; Grimes & Doole, 2010). The diagram below proposes that when it comes to corporate logos warm colours are evocative in a positive sense, and blues represent a feeling of trust and dependability. The analysis illustrated in this diagram puts emphasis on the gains from the targeted use of each colour in the spectrum, within branding (Fig.6.7.), and so one can assume that a poorly chosen colour might produce adverse results. An example of this point might be choosing red for an undertaker business logo, or light grey for a highly competitive sports logo.

Fig.6.7. Colour-emotion guide; The Logo Company (accessed online November, 2015)


Within this art-science experiment, participants engaged with similar results, although they were required to be relate to how they felt whilst considering the context of global warming. This provided direct and immediate feedback, contrasting with the more passive and delayed feedback in the way of trading results within marketing activity.

Trends emerged within Section 1: Emotional Connection exercise. For example, markedly more participants experienced feelings of calm and hope when viewing the cool colour (blues - 92), than when viewing the warm colour (reds - 30) which evoked feelings of fear, anxiety and frustration. It remains unclear, however, which response is most likely to affect behaviour change. However, if we accept Baumeister *et al.*'s (2007) theory that emotion has the power to shape behaviour through anticipation of regret and as a feedback mechanism, one might assume that painting B has more impact. This does not however mean that resulting behaviour would be more effective within climate change adaptation, or indeed human survival. The resulting behaviour of anticipated regret might be to withdraw and avoid (even deny).

The colour temperature (measured in degrees Kelvin) is higher for blues than it is for reds. The significance of this comparison in terms of how it might affect our behaviour has been studied in relation to lighting and work performance[27] (Mills *et al.*, 2007) which could hold clues to

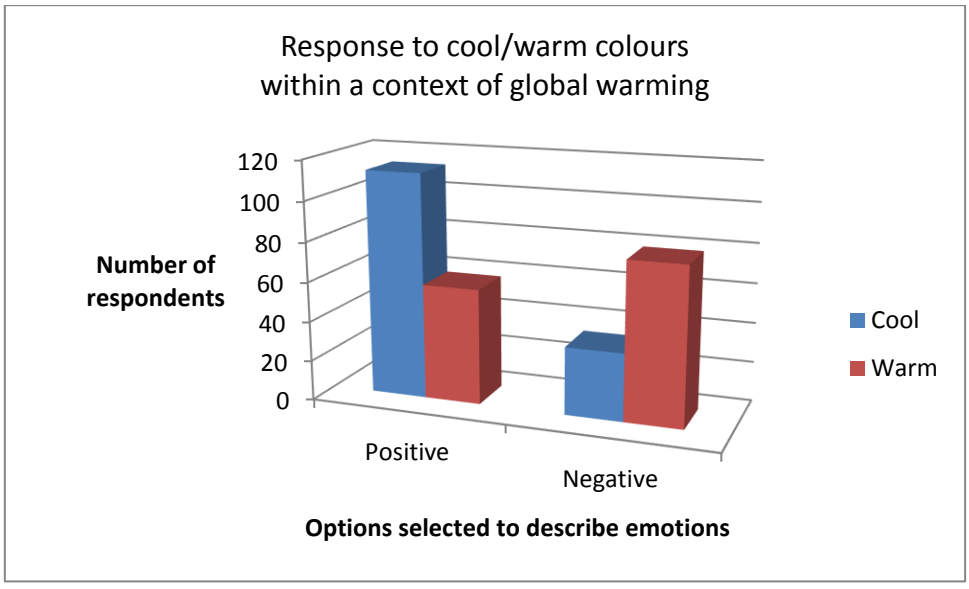
[27] The effects of lighting (in terms of colour temperature) on the human circadian system are well-established (Mills *et al.*, 2007).

biological effects, and the varying levels of motivation that are the likely result of colour temperature. There is increasing evidence to suggest that the brightness and wavelength of ambient light is not only important for task completion, but that it can also have strong non-visual biological effects, regulating the human circadian system, and impacting upon the biological clock, mood and alertness (Mills, *et al*., 2007).

This aim of the experiment in this study was to test the hypothesis that individuals would react differently to thoughts of global warming in response to the varying luminous emittance from two palettes of colour, namely blues and reds, simultaneously. It was presumed that participants would be either repelled or attracted by a colour, or put another way, have a positive or negative experience of the different colours (Goethe, 1810), and that this could have potential to affect behaviour, in this case their motivation to act within the need for climate change adaptation.

Figure 6.8. illustrates how the larger proportion of participants associated cool colours with positive emotions, within the set global warming context, (assuming calm, optimistic and hopeful emotions are positive and fear, anxiety and frustration etc. are negative).

Fig.6.8. Illustrates how the public reacted emotionally to cool and warm colours




If images are to be used within climate change science communication, then this result might be significant, especially where public co-operation is being sought. Bearing in mind the hypothesis that colours have either positive and negative effects on human emotions (in this case within a set context), one would suggest that the predominant colour palette of the

following paintings used in Section 2, might also have influenced participants' decisions within the task, although it is important to remember that the focus of the experiment was the perceived narrative and related emotion.

This set of two paintings with contrasting scenes in Figure 6.9. was created as a means of exploring how the public respond when invited to relate themselves to a choice of scenes, and how their motivational traits (modified from Charvet, 1997), might affect their decision-making within the exercise.

Fig.6.9. Contrasting scenes for experiment with motivational traits

A

B

The subjects in both paintings were designed to be relatively anonymous and not identifiable as any one race, gender, nationality or culture, to reduce the likelihood of choices being made through direct association or prejudice. Participants were invited to answer questions relating to self-perception within group situations. The purpose of these was to help determine their motivational tendencies so that it might be possible to see if there was a correlation between traits and choices within the subsequent section of questions. Firstly, participants were asked within which of the two scenes they would feel most comfortable about placing themselves; secondly, if they believed there might be a leader in either, or both scenes; having decided if there was a leader, did this change how they felt about joining that scene, and finally, where would they place themselves, in relation to the other people in the scene, e.g. in front of them, amongst them or behind them.

Understanding how individuals engage with perceived positive / negative imagery, associated with colours and with subject matter, helps provide clues for science communication design. Section 2: Motivational Response, explored individuality and personality using two different

scenes or perceived narratives. The public demonstrated that they could place themselves (hypothetically) within the paintings, and sense or decide whether a leader existed amongst the subjects depicted. What is remarkable is how decisive the public were about this choice of two scenarios, each subject to its own interpretation as far as the story is concerned. None of the participants expressed indifference or difficulty in deciding which scene they would be happiest being part of. The split was A: 22%, B: 78%, with the majority choosing to be placed *amongst* the people in both A or B, as opposed to in front or behind.

The experiment did not require participants to offer reasons for their selections. In this section, each painting was contrasting in subject matter, (unlike Section 1), and colour tones were contrasting. However, the effects of colour were not explored within this section. It is acknowledged that colour may have influenced participants none the less. Painting A's darker, more focussed and enclosed, tunnel theme contrasts with the lighter, sunny, open-space theme of painting B. Again, theories on emotion and behaviour (Gray, 1990; Baumeister, *et al*., 2007; Mills, *et al*., 2007) are useful in several ways. Participants are exposed here to contrasts in luminous emittance as well as subject matter and the likely overlap of thinking and feeling makes analysis difficult. In producing these two images, the artist has designed A to represent fleeing from danger, and B to represent hope and opportunity. However, in choosing either of these images over the other, the individual responding could be demonstrating either Approach behaviour or Withdraw behaviour (Gray, 1990), also described as Toward or Away From behaviour – modified from Charvet, 1997).

The motivational traits questions, modified from Charvet's (1997) theories on communication in the workplace and Away From versus Toward, which preceded this section of the experiment, were aimed at predicting how participants might respond within the task of choosing between the different scenes. Charvet (1997) suggests a similar categorization to Gray's (1990) in that observable behaviours can be divided into either withdrawing from a situation or approaching it, and again, can be related to Baumeister's (2007) feedback mechanism and the power of anticipation of regret (as emotion). For example, participants self-categorising as Away From motivational types were anticipated to prefer to place themselves in painting A, as this scene could suggest escaping danger. Similarly, Toward types were thought more likely to choose painting B because of its impression of hope and reaching something better. If art's role within science is to help stimulate behaviour change within

climate change adaptation, then this experiment suggests that different personalities need different visual stimulus, and that the more optimistic visual attracts a larger audience.

Although this sounds simple in theory, it is complex in practice and therefore problematic. The results of the personality traits related to painting choice in this experiment were inconclusive and did not provide satisfactory empirical evidence to support the aims of the experiment.

Participants choosing painting B were anticipated to have chosen self-describing answers that indicate them as Toward types in contrast to Away From types. However, it is likely that participants have answered with some bias and conscious choice over how they prefer to be perceived in a social group. If this is the case, then theories on self-categorization which make a basic distinction between personal and social identity as different levels could be useful (Turner *et al*., 1992). It is argued that self-categorizing is inherently variable, fluid and context-dependent, since self-categories are social comparative and always relative to a frame of reference. The variability of self-categorizing ensures that cognition is always shaped by the social context within which it takes place.

The context for this experiment was made up of many social elements, namely public exhibition, environment, location (e.g. National Assembly for Wales; Cardiff; Arts Centre) and the set context within the experiment i.e. climate change. All these could potentially influence a self-categorizing exercise. Nevertheless, based upon participants' willing engagement in the experiment, it is considered worth re-designing and repeating, drawing on knowledge from within the field of social psychology.

When it comes to interpretation and story-telling, the previous two images were relatively accessible, however, artworks are often abstract and highly conceptual. Section 3: which explored accessibility, experimented with public engagement using a set of two images depicting the same story but executed in firstly abstract style, followed by a representational style. Within this experiment the objective was to compare responses to two paintings with different painting styles but similar colour palettes, to find out how engagement might differ with ease of accessibility.

## 6.5. Connecting clues and solving.

Figure 6.10 are paintings of the same subject or theme, but executed in two different styles, that is abstract (A) and representational (B). Where possible, painting B was displayed out of sight of the viewer when responding to painting A so that it did not provide any clues or cues for interpretation.

Fig.6.10. Same subject, different styles; abstract versus representational.

A

B

The result was that the ambiguity of image A stimulated some imaginative speculations as to the meaning, potentially boundless options, whilst participants seemed to connect with the more clichéd image B, by reiterating the commonly publicised story of the plight of the polar bear. The iconic polar bear was recognised despite it being depicted in red instead of white. Contrary to expectations, its' colour was only remarked upon by two participants.

Based on the variety of responses it would be reasonable to conclude that image A was more engaging than image B and this might be because the mystery (Bacon, 1909-1992) that the ambiguity (Ruddock, 2013) of image A presented to the viewer was more curious and stimulating to the imagination. The more clichéd image B provided an immediate prompt and

it could be said that it stole the opportunity for individual interpretation. Whereas other studies (Bohnsack, 2009; Berger, 2008; Rose, 2007) concern themselves with the analysis and interpretation of images, through semiotics, iconology and the formal structure of images etc., this qualitative experiment is simply concerned with the relative ease with which the public engage with images of varying accessibility, in terms of story. For example, one might have assumed that the public would struggle somewhat to relate to an abstract image and occasionally fail to contribute ideas as to its meaning, even where the viewer could still derive aesthetic pleasure from the image. However, this experiment confirmed that public engagement with the abstract image was forthcoming and creative. It is possible that the ambiguous abstract suggests no correct answer and therefore encourages unconscious and spontaneous response, whereas the hint of a pre-determined narrative within an image (such as painting B), might inhibit free interpretation on the premise it might be incorrect. Similarly, school pupils in the class setting were initially hesitant to give their feedback because they would normally aim to answer correctly, it was necessary to give encouragement and reassurance that no answer would be considered incorrect. An alternative explanation for the creative responses generated by their engagement with the abstract painting A, could be humankind's fascination with solving puzzles.

## 6.6. Compositional impact.

These two paintings in Figure 6.11. were used in the experiment to test the drawing principle (Green, circa 1880) that a stronger composition, where the content is arranged in a certain order, has the most impact. The same items are found in each, but arranged differently, whilst everything else remains the same, such as colour palette, overall size, materials etc. There was no set context for this task as the aim was to simply gauge which arrangement of objects had the strongest visual impact. Participants viewed images (a) and (b) simultaneously, and were asked to choose which one they felt strongest about, or were drawn to most.

The public responded in almost equal proportions, i.e. A – 53% and B – 47%. However, this section (4) was not executed to the artist/author's satisfaction and did not satisfy the aims of the experiment, as discussed in the concluding chapters. Both versions of the subject have merit and strength of composition, which defeats the object and could explain the almost-equal result.

Fig.6.11. Paintings for Section 4: Strength of composition

A B

Nevertheless, the public made a choice between the two paintings depicting different arrangements of the same collection of objects. Some engaged more favourably with A because of the togetherness of the grouped objects, and others engaged more favourably with B because of its separate-ness or extra space between objects. Once again, the public engaged willingly and decisively. A repeat of this experiment, executed more effectively, would be expected provide evidence which supports the hypothesis and the principles of composition, within the practice of art whilst proving that a stronger composition has more impact on its viewer.

## 6.7. By casting their vote.

The climate change Image Poll (or "Pick A Card" exercise) in Figure 6.12. produced relatively consistent results. It was intended as a quick response task and aimed at measuring immediate visual impact. Images included a range of media such as photographs and graphics selected from internet image collections to offer a range of styles and topics related to climate change impacts. Some were international and some depicted local, UK scenes. and of a variety of

media such as drawn graphics, a photograph of an art installation as well as digitally manipulated images

Fig.6.12. “Pick A Card” Climate change Image Poll

. This was an experiment on the simplest level, unlike previous empirical studies which sought articulation by respondents using interviews with a non-representative sample of 30 selected public, and 32 climate change images and later, the Q-method, VisionS and IconS with a sample number of 60 (O’Neill & Nicholson-Cole, 2009; 2012), The focus with previous studies has been on assessing visual power and measuring saliency and efficacy, reference media published computer generated visuals. In contrast, within this quantitative Climate Change Image Poll study, the public engaged with the idea of choosing the climate change impact image that they found most disturbing, and the results indicated clear favourites, although these differed between the adults and under-eighteen-year-olds. There was no interview nor requirement to explain their rationale for their choice of image, as the emphasis within this task was on immediate impact.

A total of 408 members of the public took part at several locations; the following table shows how they voted. The most popular choice amongst adults was a photographic image of a child in a barren landscape, followed by the polar bear stranded on a small sheet of floating ice. However, the most popular choice for under-eighteen-year-olds was the more fantastical image of a man in a shirt with a head like a fish's. A few participants were curious to know if their choice was consistent with the consensus.

The popular reason given for choosing image 2 (Apocalyptic, barren landscape and child) was said to be the vulnerability of the lone child. It would be reasonable to presume that the lone and vulnerable predicament of the polar bear was largely due to it being the second most popularly chosen image, number 1 (Polar bear stranded on ice). This could suggest that the public engage through emotions of pity and conscience.

Other images used in the task were dramatic but perhaps not emotionally evocative. The image in third place, number 5, the WWF digitally manipulated photographic image of a man with a fancy shirt and a fish head, was the most popularly chosen image with under eighteen-year-olds, and third most popular with adults. It is an impactful, imaginative and well-designed image that is both shocking and comical…just like the face of a clown might be described, and in general, the public either love clowns or hate them, but either way, they are visually impressive. Image number 9 consisted of a globe with a direct message in text which read "*you control climate change*", but this did not appear to have an impact with many participants, and in some cases, where it was possible to discuss their choices afterwards, it was rejected perhaps as if to say, "*we are not in control and resent being blamed and held responsible*". Despite being a cleverly thought-out idea and well executed from a graphic point of view, it was thrown-out by the public, most likely due to the absence of human/animal element. It is also highly contrasting and could be considered an example of distancing framing, alienating and difficult for the public to identify themselves with. In other words, the viewer is forced into a critical, analytical frame of mind that calls upon her to interpret the self-contained narrative. This effect of making the familiar strange teaches the viewer not to take the style and content for granted, since the medium is highly constructed (Willett, 1964).

Comparing age-groups, it appears that for adults their choice might be related to loss, regret and a sense of responsibility and again, compares with Baumeister's (2007) feedback mechanism and the power of anticipation of regret (as emotion). In contrast, for the younger population impact appears to be made through the unusual, novelty and imagination. In this

way, Gray's (1990) theory that observable behaviours can be divided into either withdrawing from a situation or approaching it stimulates an interesting question which is "*could these more novel images most popular with younger people have been chosen because they were attractive?"* In other words, were they approaching as opposed to withdrawing? In addition, discourse that followed image selection by adults would suggest that their choice was also influenced by perceived credibility and fact as opposed to fiction. This is evidently not the case for younger participants.

Table 6.7. shows the number of participants who chose each image as most disturbing within the context of climate change impacts, for each field research event, including both adult and under-eighteen-year-olds. From a total of 408 participants, the overall result was that image number 2 had the highest number of votes (22%), followed closely by number 1 (20%) and thirdly, number 5 (17%) which was the most popular with school pupils. It is interesting to note that image numbers 1($2^{nd}$) and 2($1^{st}$) represented geographically distant locations whereas number 6 attracted only 7% of votes even though it could be considered the image which related most to participants' day-to-day living, locally.

Whilst this simple Climate Change Image Poll exercise was aimed at collecting instinctive responses to climate change images based on their ability to cause disturbing effects, it seems logical to presume that the images they chose would be ones which they were most likely to recall and refer to later, perhaps while talking to associates and colleagues, friends and family. It can be useful to have a mental image to recall when trying to process information which can often be confusing with regards to climate change, even if it is not specific to that information, and helps us to place it within a context, so that judgements and decisions can be made.

The results of empirical studies that investigated the role of visual, and iconic, representations of climate change for public engagement respectively, have demonstrated that although such representations have much potential for attracting people's attention to climate change, fear is generally an ineffective tool for motivating genuine personal engagement. Furthermore, it is suggested that nonthreatening imagery and icons that link to individuals' everyday emotions and concerns tend to be the most engaging (O'Neill & Nicholson-Cole, 2009).

Table 6.7. League table for climate change image poll.

**POLL "Most disturbing / Biggest impact or impression"**

**Climate Change Image (Field Research) Rhian N Field 2014-15**

| | | | CarC Dec 2014 | DyfB 2015 | SPembs 2015 | Schools (under 18) | Misc plus Interviews | Online | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Polar bear stranded on floating ice |  | **14** | **1** | **44** | **14** | **3** | **5** | 81 | 2nd |
| 2 | Apocolyptic, barren landscape and child |  | **27** | **4** | **37** | **16** | **3** | **2** | 89 | 1st |
| 3 | Message conveyed through Humour |  | **3** | **1** | **26** | **5** | | **2** | 37 | 5th |
| 4 | Technical Graphic illustration |  | **1** | **1** | **7** | **0** | | | 9 | 10th |
| 5 | WWF : Nice shirt! - but head like a fish |   | **8** | **1** | **34** | **23** | **1** | **2** | 69 | 3rd |
| 6 | Local neighbourhood flooding |  | **8** | | **17** | **4** | | | 29 | 6th |
| 7 | Storm surge and high seas at coastline |  | **2** | | **16** | **2** | | | 20 | 7th |
| 8 | Isaac Cordal - climate and capitalism tiny sculpture |  | **6** | **2** | **23** | **0** | **3** | | 34 | 4th |
| 9 | Abstract idea - a reminder/suggestion that humankind is in control |   | **0** | | **9** | **9** | | **1** | 19 | 8th |
| 10 | Industry and carbon emissions |  | **3** | | **10** | **8** | | | 21 | 9th |
| | | **Participant TOTAL** | **72** | **10** | **223** | **81** | **10** | **12** | **408** | |

## 6.8. Imagining and drawing.

Unlike the Image Poll previously discussed, the invitation for participants to draw within a small blank box, influenced only by the set subject of climate change, promised unpredictable outcomes. Each unique image was created from their imaginations, and influenced by impressions made on them through their experiences and exposure to other visuals and information about climate change impacts. The question of what would make an engaging climate change icon has been posed to a sample number of 80 participants in previous visual studies (O'Neill & Nicholson-Cole, 2009). The study, carried out between 2005-2006, consisted of a specially selected, culturally and spatially diverse audience, which featured participants from a range of sociodemographic backgrounds, social groupings, ages, and nationalities.

Two different methodologies helped to reach these diverse participant groups. Focus groups (n = 27) were carried out with local parents of high school–age children and with fellows from the Leadership for Environment and Development network. An online survey (n = 63) was designed to explore issues of climate change representation in such a way that it allowed individuals to engage with the issue through their personal perceptions and values. The study was developed through the concept of climate icons, defined as "*tangible entities which will be impacted by climate change, which the viewer considers worthy of respect, and to which the viewer can relate to and feel empathy for. Outcomes of the studies indicate that meaningful engagement approaches must involve some degree of connection with "the everyday,*" in both spatial and temporal terms. However, in contrast to O'Neill & Nicholson-Cole, (2009), participants in this art-science research project were invited to illustrate by drawing (and describe, in the case of online questionnaires) their ideas of what might represent climate change, e.g. symbols, icons etc.

It is likely that some were influenced by images that have been published by the media, however, there is a sense of instinctual response also. Consider John Berger's (2008) ideas on "*Ways of Seeing*"; The way we see things is affected by what we know or what we believe. Therefore, it is not a question of mechanically reacting to stimuli, and this is so for participants picking up the pencil to draw. "*Every image embodies a way of seeing*" (Berger, 2008), and this collection of participant drawings embody the public way of seeing the climate change crisis. Words alone would not express how their minds see the potential scenarios ahead.

The drawings were analysed in terms of content (Rose, 2007) based on counting the frequency of certain visual elements and then analyzing those frequencies. This method offers a clear approach for engaging systematically with large numbers of images. As the researcher is required to make a subjective interpretation of the elements before coding the content, this method calls on both qualitative and quantitative analysis. The resulting data were then presented in graph format (see below Fig. 6.17.), which was further divided for the age groups i.e. adult and under 18-yea-olds for comparative analysis. Consideration was also given to additional visual methodologies such as would explore cultural meaning, compositional meaning, in other words, what story the content of one image might be attempting to convey, as well as semiology. However, a simple, non-speculative approach was thought to achieve the aims of the field research, which were to gain insights into how the public engage with art, within the context of climate change impacts, and to discover which icons represent climate change impacts in the most straightforward way.

The results were imaginative and forthcoming. The public were happy to attempt a drawing even when they lacked confidence in their drawing skills. They willingly set about illustrating their ideas on paper and provided an insight into how they perceive the most critical climate change impacts to be. Some of the drawings consisted of just a few lines and shapes that represent an idea, whereas others were comprehensive and contained more than one concept or event in one picture. Telling them apart when it comes to the participant's age-range is difficult. Re-occurring themes differed to some degree between young people and adults. For under 18-year-olds death and drowning, and seal level rise were the most popular themes by far, whereas adults provided a more even spread of ideas. Themes included tornados, stormy clouds, floods and people drowning, globes, polar bears and the sun, to name but a few. The written explanations next to the drawings are very helpful and allow us to fully understand the idea being conveyed.

The few examples included in Figures 6.13–17 help to illustrate the public's level of engagement. Please note: The full catalogue of drawings by the public can be viewed in the appendices.

Fig.6.13. "Epic storms, failed crops, drought, flooding / sea level rise, *climate change – refugees in 'the South' – 'West' closes its' borders. Despair!"* Male aged 22-30

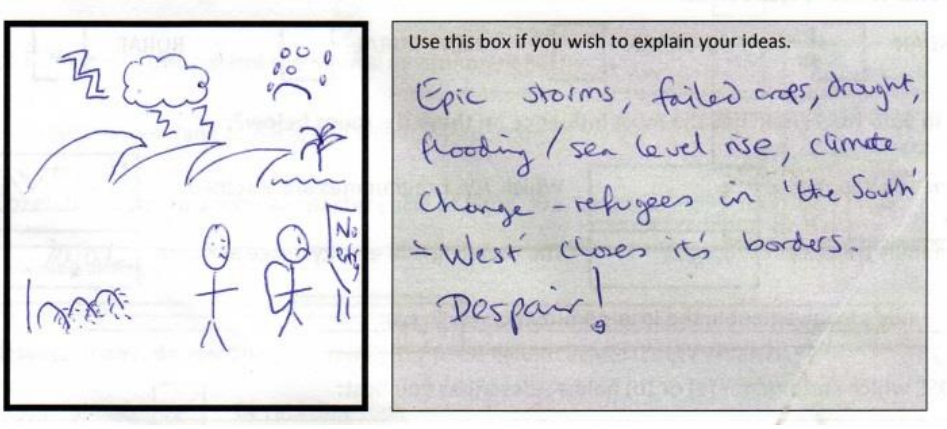



Fig.6.14. "Earth?" Female aged 41-60

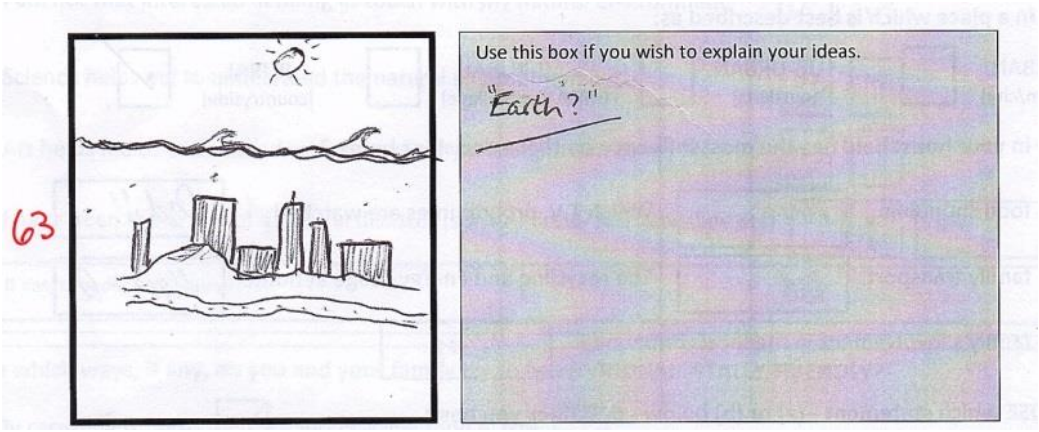



Fig.6.15. "Natural world all dead. Exclusive cities, plastic lives. *Transportation to other space stations"* Female aged 17-21

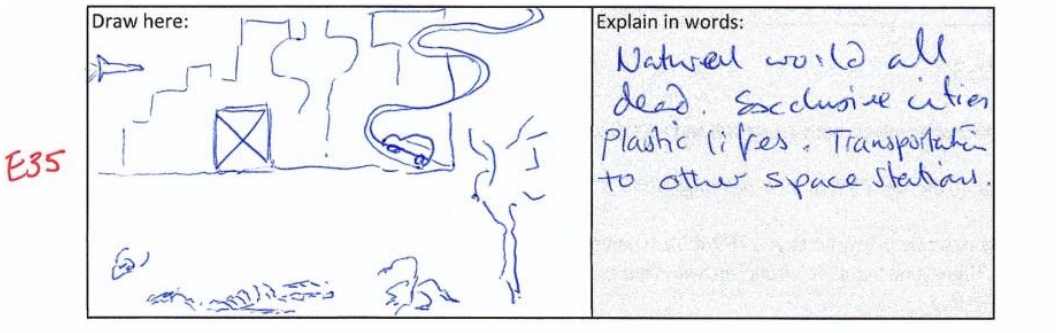
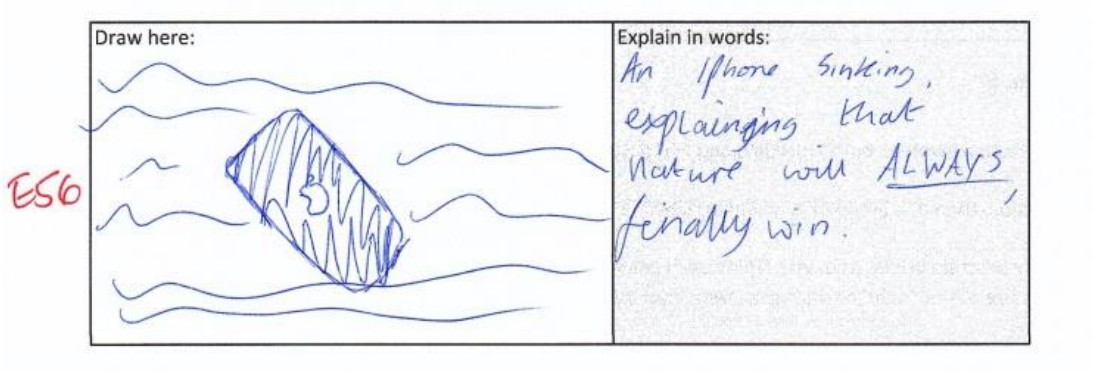


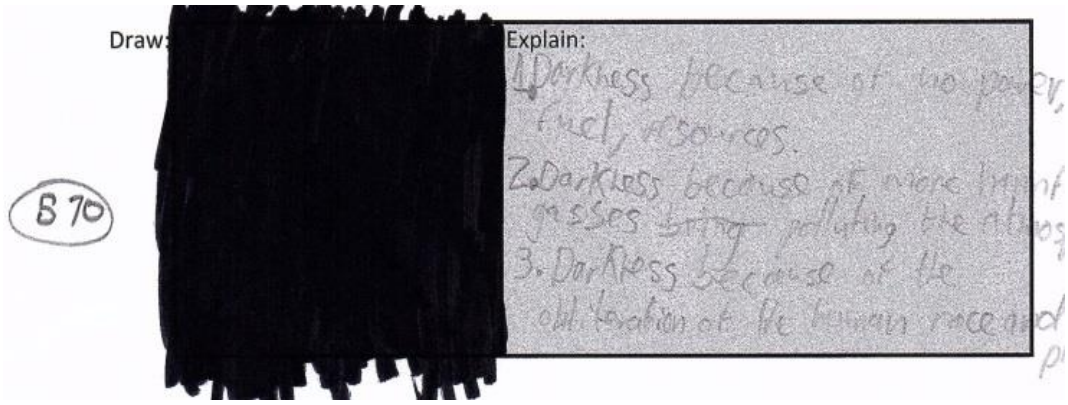
Fig.6.16. "An iPhone sinking, explaining that Nature will ALWAYS, finally win." Female aged 16




.

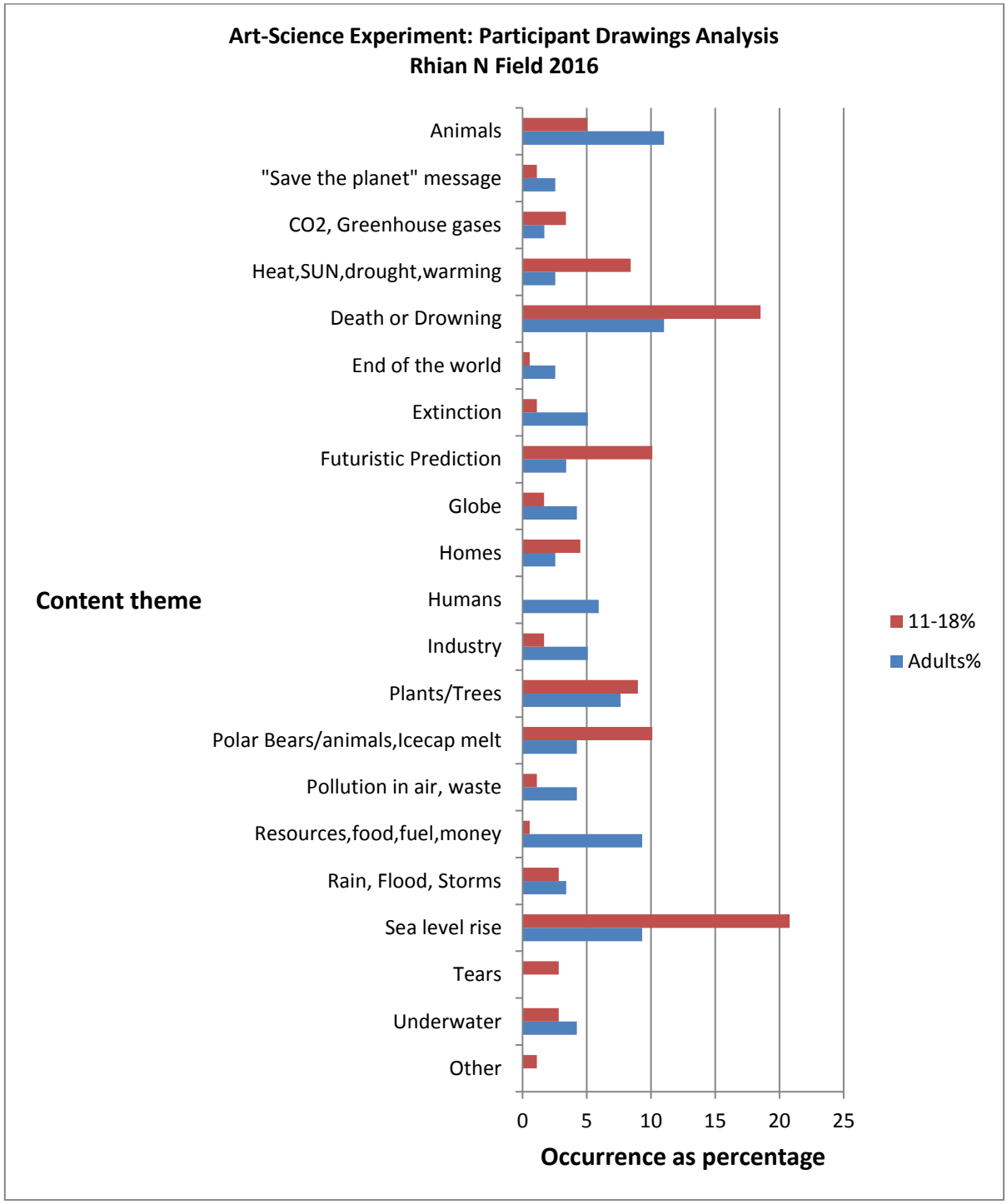
The final example Figure 6.17. appeared at first glance to be a protest – a defacing of the questionnaire, as if to say, "*I refuse to take part*" or similar. However, it was to be one of the most impactful visual and textual responses of all. The fifteen-year-old male student evidently put some effort into blacking-out the box and then quite eloquently articulated it. It has a poetic quality.

Fig.6.17. "1. Darkness because of no power, fuel, resources. *2. Darkness because of more harmful gasses polluting the atmosphere. 3. Darkness because of the obliteration of the human race and planet".* Male aged 15.




From Figure 6.18. we can see that across all age groups studied, there are two dominant visions – "Death or Drowning" and "Sea level rise" and these impacts are most prominently depicted by under-18-year-olds.

Fig.6.18. Participant drawings content analysis graph.




It follows that they provide insights for the field of climate change science communication, as the analysis shows one impact's relative importance to another, from the public's perspective.

## 6.9. Summary

The public demonstrated willingness to participate and a commitment to art. They hold a positive outlook on whether art can influence decision-making and this is backed up by their suggestions that art's potential lies in its ability to evoke, act as a mirror, help with understanding, get-away with saying things that are otherwise frowned upon (it is autonomous), it helps us to see through a different lens / window, and is provocative.

Responses by under eighteen-year-olds to the question of climate change impacts were markedly more imaginative and in some cases more visceral than those from adults, for example, "*bad weather and storms make people sad*". Adult responses could be described as more objective and dispassionate. Perhaps they have more free time and space, so that they can fully digest the prospect of environmental change and what it means to them (through imagination and the joining up of ideas). The adult community might only afford enough time to accept what is given in the way of catchwords, phrases and images flashed up within the media.

Through participation in the field research tasks which required story-telling, the public could relate, regret, connect, to pity, to be aware of their conscience, to feel pride, fear, disgust, anger and a sense of community. Further research is needed to determine what scope there is for these emotions within climate change adaptation.

Through engagement with the visual art within a climate change context, the public contributed to the debates with articulate expression. They were questioning, self-solving, and acknowledging of some responsibility. When asked to relate to global warming, whilst viewing two paintings of different colour temperatures, their responses indicated that their experience of each one, was distinctly contrasting. The key evidence focused on here is of engagement through imagining, relating and connecting, and not the implications of different colour hues evoking different emotions, although this is an area of research which can be followed up in the future. Similarly, there is evidence of imagining and relating, in placing themselves within the scene in Section 2, however in this case the image contains other human beings, which could represent community or society in general. Their decision-making for this task reflects their social personality, in other words, how they might behave in a crowd. It also indicates what might attract them, and what would deter them, i.e. the response to visual stimuli, and scene-setting, of both Toward and Away From personality types.

The stark ambiguity, as presented in Section 3, acted to generate new ideas, and open-up new avenues of thought. Furthermore, it did not need to be real for the public to relate to it, for example, the abstract painting A, and the red polar bear in painting B. The simplicity of Section 4's arrangement of objects appeared to connect with the public's sense of relative space…personal space it seems. In any case, participants were decisive in choosing between the two options. Further research might explore how individual relationship with space affects motivation to act within climate change adaptation.

The "*Pick a Card*" image poll exercise served three purposes by filling the gap in between other more complex ones, allowing easy access to those who could not, or preferred not to commit to the other, more time-consuming research activities, and provided confirmation that certain content within images consistently have more impact than others.

And finally, when invited to contribute their original, creative expression in the form of drawings (or descriptions in the case of online questionnaires), the public proved capable of illustrating their perceptions of the pressing concerns relating to climate change impacts. To achieve this, participants engaged by means of hypothesizing, predicting, fantasizing, exaggerating, dramatizing, suggesting, signifying and impressing - e.g. Drawing no. B70. One could say that the drawings acted as the public articulation of their understanding, beliefs and attitudes towards climate change impacts, in other words, the public voice.

All in all, one could say that the field experimental research painted the picture of how the public perceive and receive the notion of climate change. If there were ever any doubts about visual art's ability to engage the public in a topical debate, then they can surely be laid to rest. But more than this, engagement such as was witnessed here, brings something extra to the climate change adaptation table, as is explained in Chapter 7: What is the opportunity for art-science within climate change adaptation?

# CHAPTER 7: The opportunity for art-science

How might public engagement with visual art within a context of climate change hold potential for behaviour change and adaptation?

## 7.1. Introduction

Chapter 5 and the art of human crisis provided an overview of examples of art responding to different cues. The three collections of visual art examples explored could defined with three different agendas or objectives. For example, the art of extreme weather events tends to be pictorial and evocative, assisting its audience to relate themselves to the environment. The poster art of World War II has a clear objective or instructing, motivating and uniting, whereas the art of climate change is proactive in attempting to persuade and compel action. Ascertaining which approach and which agenda has achieved most success is problematic.

This field research was designed to avoid an agenda other than to explore the interaction between contextual visual art and the audience, for the purpose of assessing opportunities for its application within climate change adaptation. After all, who wants to adapt for climate change? Who says there is a need to? Are there more pressing concerns to worry about? When asked what they believed threatens our way of life most today, adult participants responded by associating them with human behaviour, attitudes and societal conditions. Examples of this include lust for money, "*blind profit-making*", *consumerism, lack of understanding of the consequences, lack of self-awareness, blind denial, lack of forward-thinking, and negligence*". Apart from human behaviour being identified as a threat in general, the public blamed global corporations, rapid industrialisation, religion, terroism, resource wars, growing populations and resistence to sustainability due to greed and self indulgence.

The impression is that the adult public believe the main threats to our way of life are brought about by humankind, in other words things which are within our control to change. However, climate change, it seems, is yet to be acknowledged by the adult public as a potential exacerbator of the current perceived threats to humankind, let alone the other way around, i.e. humankind's behaviour exacerbating climate change impacts.

When it comes to comparing differing beliefs and attitudes across age-groups, a study by the European Commission in 2008 titled "*Attitudes of European citizens towards the environment*", (European Commission, 2008a) reported that socio-demographic factors do not appear to extensively effect the spontaneous impressions of European citizens, with the exception of climate change: The younger the respondents are, and the longer they have spent in full-time education, the more likely they are to connect the concept of environment to climate change. In a further report "*Europeans' attitude towards climate change*", they state:

> "*…from a socio-demographic point of view we see that: Men feel better informed than women about the causes of climate change, its consequences and the ways it could be combated. The group of older respondents (aged 55+) feels significantly less informed than its younger counterparts about these issues. The self-perceived level of information among respondents increases along with their levels of education."* (European Commission, 2008b p.21)

In contrast to this research, and especially the drawing exercise, these two reports rely on quantitative data, and respondents choosing between set answers.

The findings of Mower's (2012) study of climate change curriculum[28], is comparable with the results from the experimental field research done here with school pupils. It explores links between a school's approach to climate change education and its pupils' responses, in schools in England. From a sample of 152 school pupils, 83% believe climate change is occurring and they understand some of the reasons why. Regardless of their schooling, they generally correctly identify some impacts, but most lack a thorough knowledge of climate change. Pupils feel partly responsible for climate change, but this does not translate into behavioural change. Studying GCSE Geography alters these traits very little, although it is encouraging to note that Welsh schools were issued with bilingual climate change packs in 2011.

It appears from the research carried out here, that young people demonstrate great potential for grasping (intellectually), and communicating climate change impacts, through an artistic

[28] According to Mower, 2012, The National Curriculum does not specify that climate change must be taught in GCSE Science classes, only as a basic concept in KS3 Geography, and even there it does not specify that climate change is a human-induced phenomenon (QCA, 2007a, 2007b). The National Curriculum does however facilitate and almost encourage the teaching of some aspects of climate change in Science classes as human impact on the environment is a compulsory topic.

medium. However, this is not currently translating into environmental sensitivity, in their everyday lives.

When considering the comparative responses between the age groups, the question that comes to mind is "*do we preach better than we practice*", in other words *"teach better than demonstrate",* or has there been a shift in attitude through time? Alternatively, there could be natural transformative processes at play, during the transition from child to adult. A recent article in The Guardian by Eleanor Roberts suggested that there has been a damaging influence on the attitudes of "*millennials*" (born between 1981 and 1997) by "*baby boomers*" (born shortly after the Second World War). Roberts (2015) refers to the newly released report by the Pew Research Centre, showing how these age groups define themselves differently in terms of moral virtue, self-reliance, compassion and responsibility. The reasons for this apparently differing attitude towards causes and impacts of climate change between child/adult stages (or generations), deserves further exploration, with opportunity in mind.

Public opinion on art-science as a communicator is mostly a positive one. It was suggested that art can relate to different people in different ways, affecting emotions which can then be intellectualized. It is believed that art-science can break down difficult theories and hypotheses into artistic messages, which are more easily understood. As one respondent suggested,

> *"A picture holds a thousand words – in every language, and stays in the mind as an idea, a dream. Show change due to man, beauty in nature, man as nature – not above, or separated from nature".*

Another suggestion was that art brings science to life and can help explain complex technical issues, using both subtle messages and obvious ones. It has the power to disturb public opinion within the political arena and help us to visualise the impacts of climate change. One participant suggested Figure 7.1. was very impactful and had the potential to influence public thinking.

The critical element within this image, however, is likely to be the child because it heightens our awareness of the vulnerabilities of humankind, and appeals to our sense of responsibility as parents and guardians. The novelty factor within this artistic image draws our attention through curiosity and our attraction to problem-solving or making sense of our environment.

As one respondent put it, art can present science in a way that people can relate to – or which taps into emotions and our imaginations that scientific publications cannot.

Fig.7.1. "*Just because you can't see it doesn't mean it isn't there*". Advertisers Without borders, 2011.

When asked if art-science can help us be more prepared to adapt, respondents within the Dyfi Biosphere area gave a mixed response, but most participants made a commitment to answer the question as comprehensively as possible within the time available, suggesting that the linking of logic and art could be the most fertile of all creative grounds, and that:

> "*We, as an audience, do not want vacuous entertainment anymore, we have agency, we have intellect, we want to be involved."*

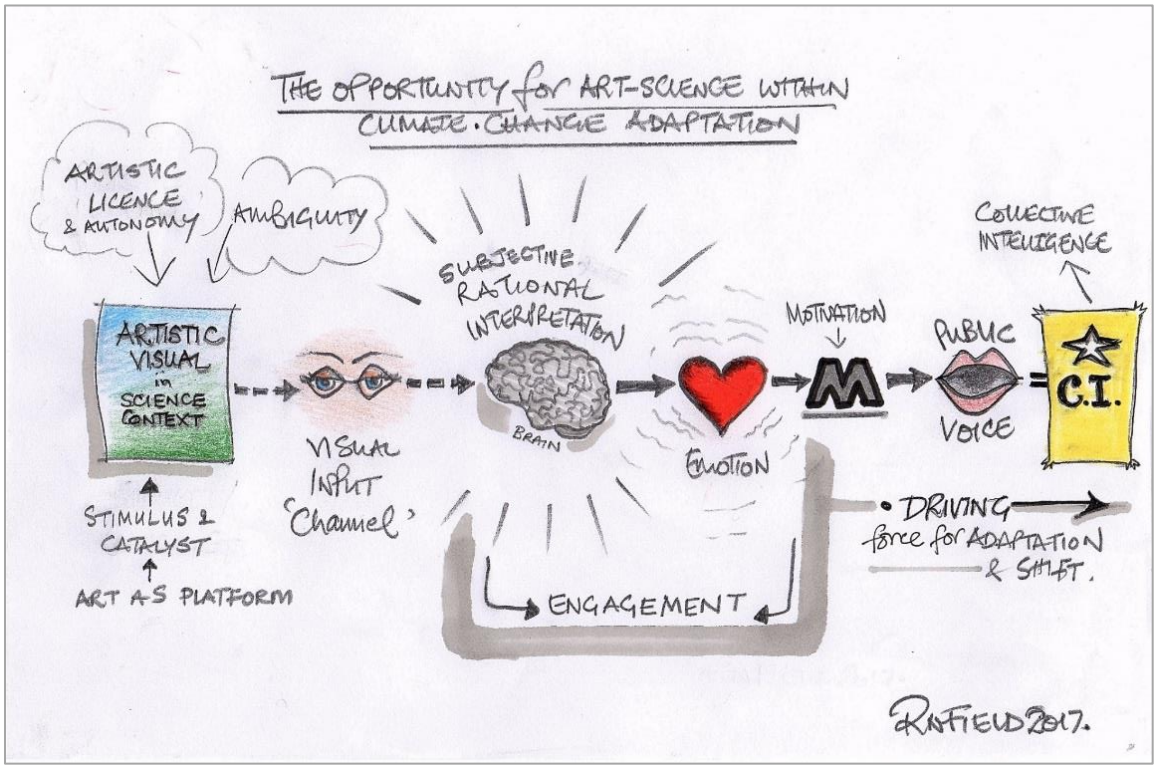
There again, not all art is viewed as accessible or easy to engage with, which suggests that if art is going to engage the public, it needs to be brought out of the high end to the "*real people*" to properly engage in real issues, and "*that's up to the artist*". Furthermore, they believe that the public respond better to subtle messages that they work out for themselves rather than blunt messages linked to scientific facts and figures.

The results of the empirical field research help with understanding how participants sense and imagine their world of climate change, and offers clues to their perceptions of an anthropogenic future. The catalogue of participants' drawings serve as a unique record of the public's current knowledge and understanding of climate change, and the collection provides archival material which illustrates the public's 21st Century visions of the future.

Across all age groups, the participants' willingness to pick up a pen and draw, without having the confidence of a practiced artist, is both humbling and encouraging. However, it merely serves in scratching the surface when it comes to the potential for art to engage the public in the science, and for the public to be proactive in helping to build an adapted way of life. Creative drawing assists creative thinking. Creativity is critical to survival (Mathers, 2012; Hausseman, 2014; Steinberg & Lubart, 1991).

The oportunity for art-science within climate change adaptation can be described as a process which can tap into the collective potential of the public to drive change . In other words, art-science which is not aimed at communicating *to* the public, but instead, aimed at acknowledging and harnessing the power of the public voice, as a social influence and policy-shaper, could be where art-science's potential lies. The diagram in Figure 7.2. illustrates this process, starting with the artistic visual as the catalyst for engagement in the climate change debate. The product of such engagement holds potential for active citizenship through many responses discussed in Chapter 6, such as a range of emotions, connecting, relating, imagining, offering opinion, protesting and solving, etc.

Fig.7.2. Process from artistic stimuli to behavioural shift.



The process illustrated by the diagram in Figure 7.2. begins with the unique, autonomous, ambiguous stimulus of the artisitc visual, founded within a science context, channelled through human receptors to the brain. Here it is subjectively rationalised and interpreted during engagment and emotional connection to motivate. This motivation is evidenced by what is voiced (or communicated in some form), and as a collection of communications it serves as a potential driving force for shifting behaviour and action. It is not so much a prescriptive engagement method but more of a stimulate and collect exercise, a genesis moment, which could bring about fresh, invigorating new thinking within climate change adaptation. This might sound a little ideallistic, however, the unique and mysterious qualities of art (practice and appreciation), with its presumed biological function (Ramachandran, 1999), suggests possibilities as yet untapped, within public engagement and movement.

## 7.2. The Opportunities for Art-Science

By summing up the opportunities that have been identified by this research, it is possible to recognise where there is scope for implementation of art-science engagement excercises.

1. **As Stakeholders – on-board; the public develop a vested interest.**

   By making a commitment (expressing conviction)
   Through being asked for their opinion (empowerment)
   By being invited to cast their vote (empowerment)

2. **By making a subjective interpretation**

   Creation of an ideas pot
   Innovative thinking – intellectual capital (the value created by individuals' ideas and expertise)
   Contributing insights
   Joining-up ideas and making connections

3. **Stimulus for change**

   Tuning-in to feelings
   Sensing
   Developing self-awareness
   By reflecting – art as a mirror

Seeing through a different lens
By acknowledging
A move away from denial

4. **Use and recognition of familiar symbols and icons**

For teaching and educating
For promotion of the cause

5. **Through relating and imagining**

Working it out for themselves
Self-efficacy
No need for preaching (which is relatively ineffectual)
Contributing ideas – drawing and describing
Hearing themselves – their own words
Creating their own ideas and sharing
Public voice having potential to drive change
Active citizenship – shaping government policy

### 7.2.1. Stakeholders with a vested interest.

When it comes to environmental management it has been suggested that stakeholder analysis is best done in the field, together with a project development team, and with extensive use of participatory consultation techniques to understand the perspectives and concerns of the different groups involved (Saleem Khan, *et al*. 2012). The complex and dynamic nature of environmental problems requires flexible and transparent decision-making that embraces a diversity of knowledges and values. For this reason, stakeholder participation in environmental decision-making has been increasingly sought and embedded into national and international policy, partly driven by increasing public scepticism about science to the extent that it is becoming regarded as a democratic right. Many pragmatic benefits have been claimed for participation such as greater quality and durability of decisions, although these claims have rarely been tested, resulting in growing disillusionment among environmental managers and conservationists who have failed to see these claims realised.

Most conservationists focus on engaging those who hold a stake in the scope of their initiative, rather than attempting to meaningfully engage with the wider audience. This was confirmed in interviews with RSPB Cymru personnel. Engagement itself, is thought to be made of different

types, i.e. “communication”, “consultation” and “participation”, which is conceptualised as two-way communication between participants and organisers where information is exchanged in some form of dialogue or negotiation. However, there is growing concern that stakeholder participation is not living up to many of the claims that are being made. Furthermore, participation can even be found to reinforce existing privilege and develop group dynamics that discourage minority perspectives from being expressed. Consultation fatigue can result from participatory processes that are not always well executed, and where apathy develops from disillusionment, or the perception that their involvement makes little of no difference to the outcome. Additionally, there are cases where stakeholders may not have sufficient expertise to meaningfully engage in what are often highly technical debates. Evaluation of stakeholder participatory exercises have focussed on the process rather than the outcomes and could be partly due to the challenge of selecting the appropriate evaluation criteria and data collection methods. It is suggested that the process needs also to have clear objectives from the outset and deploy skilled facilitation personnel.

To overcome its limitations, it is believed that an organisational culture, in the form of an institution, would be well placed as facilitator and help mitigate the perceived riskiness of participatory processes. However, despite a growing literature, there is little evidence to support claims that stakeholder participation in environmental decision-making can promote or enhance social learning (Reed, 2008).

The practiced more prescriptive, or contrived techniques (Saleem Khan, *et al*. 2012) deployed could be killing the real opportunity from engagement. This research has confirmed that a relatively diverse sample of the public can engage equally through art, with climate change issues. The inherent subjectivity of public response to artistic stimuli ensures a high degree of unpredictability, which helps avoid stifling and encourages spontaneity. In the field, stakeholders act as individuals and not simply numbers and classifications. One could argue that the finer-tuned the input, the finer-tuned the output will be, but is this what is sought from public engagement? Such an approach is in danger of being indoctrinating, requiring regular follow-up for sustainability and hold a limited shelf-life. In principle, where stakeholders have expressed conviction, become empowered through their personal contribution and therefore have a vested interest, they are on-board. Where the public can position themselves within the story, thus relating to the relevance, maybe unconsciously, of current and pending climate

change impacts, within their environment, they begin to own it. Through this ownership, and through vocalising their emotional involvement, they become empowered to influence change.

### 7.2.2. Subjective interpretation.

In an encounter with an artwork, the viewer is invited to engage in their own reflections and recall their own experiences to evaluate and interpret the work in a process of reflective thinking, to engage with private reverie and make sense of a public global reality (Duxbury, 2010).

Through subjective interpretation there is scope for innovation. As witnessed during field research activities using a set of original paintings within the context of climate change, the public contributed insights, making connections and offering creative ideas, beyond any that the artist had started out with. One could say that the public were creating their own climate change realities within the scope of the paintings, and although interpretations were individual, some were unique and many were common, however their associated emotions were consistent.

An abstract view would be that this is equates to intellectual capital, that is human capital, to be accounted for (in principle, but not mathematically) as an environmental asset, in acknowledgement of the value of public knowledge, social habits, personality attributes and creativity (Shultz, 1960; Becker, 1993). Intellectual capital is understood as complementary capacities of competence and commitment. Based on theoretically and empirically robust human capital theory, we define intellectual capital as individuals' complementary capacity to generate added value and thus create wealth. Resources are then perceived to be both tangible and intangible. This view is an extension of human capital theory to include the intangible capacities of people (Erikson, 2001).

Although it is obvious that people acquire useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital and is a product of deliberate investment (Shultz, 1961). In other words, this is not simply a case of passive engagement through entertainment and participation, but an opportunity for the active harnessing and harvesting of public input, as a return on investment towards environmental sustainability perhaps. This is one way of looking at the potential spin-offs from climate change public engagement through art-science, encouraged by the results of the field research. Having invested in human health,

welfare, education and training, and acknowledged the innate and biological qualities that humankind can offer, it would make economic and environmental sense to utilize this 'capital'.

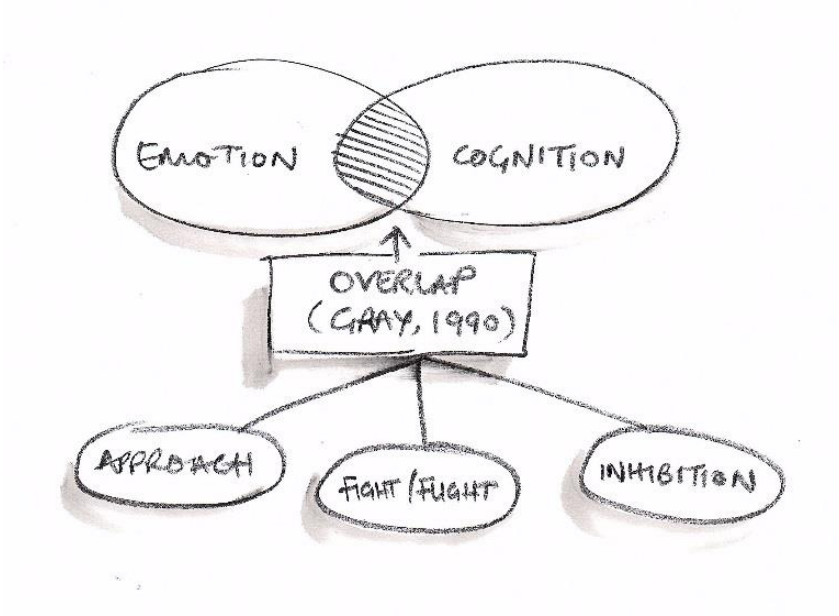
Furthermore, there is opportunity for this type of public engagement to act as a stimulus for change.

### 7.2.3 Stimulus for change.

When cognition is converted to feelings through sensing can it develop an individual's self-awareness? Emotion is central to the quality and range of everyday human experience. What is termed "*The neurobiological substrates of human emotion*" is now attracting increasing interest within the neurosciences motivated, to a considerable extent, by advances in functional neuroimaging techniques. An emerging theme is the question of how emotion interacts with and influences other domains of cognition, in particular - attention, memory, and most relevant to this research – reasoning (Dolan, 2002). We are interested here in how a visual stimulus can help the public tune-in to post-interpretation emotions which in turn have the potential to incite active behaviour, e.g. participants' response to Painting D in Section 5 of the field experiment could be described as anger and disgust which potentially incites action in the form of protest. Equally, it could also serve to reflect, like a mirror, on the participant through self-awareness thoughts of being complicit in certain ways, if only by allowing environmental pollution to happen through lack of protesting. In some cases, (and this was stated by participants), artistic images can allow the public to see things in a different way to normal, as if they were looking and understanding through a lens that provided a different perspective, and thereby offering the opportunity for enlightenment. At this juncture, acknowledgment of the crisis is more likely, followed by a shift away from a state of denial in terms of the relevance to individuals of climate change impacts.

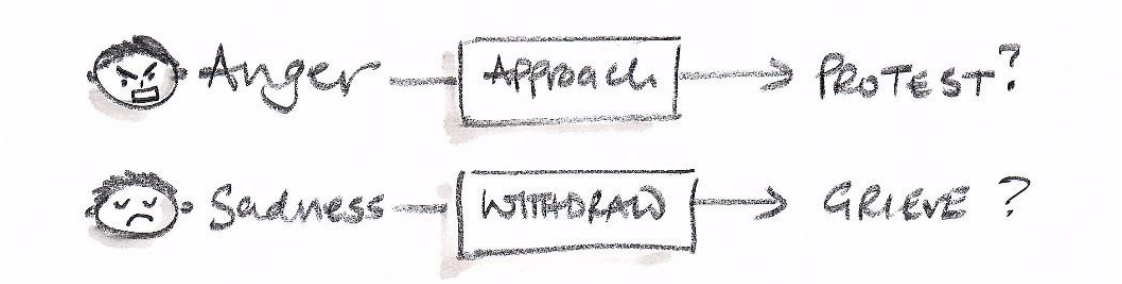
Figure 7.3. is an interpretation of Gray's (1990) theory that emotion and cognition overlap and result in varying behavioural outcomes. If art-science can stimulate both intellect and emotion simultaneously, there is opportunity to bring about behaviour change. The diagram below is a proposal of how an example of two types of emotion translates into behaviour, based on the experience of participants' responses to field research tasks relating to interpretation and feelings.

Fig.7.3. Author's interpretive diagram of Gray's model 1990.



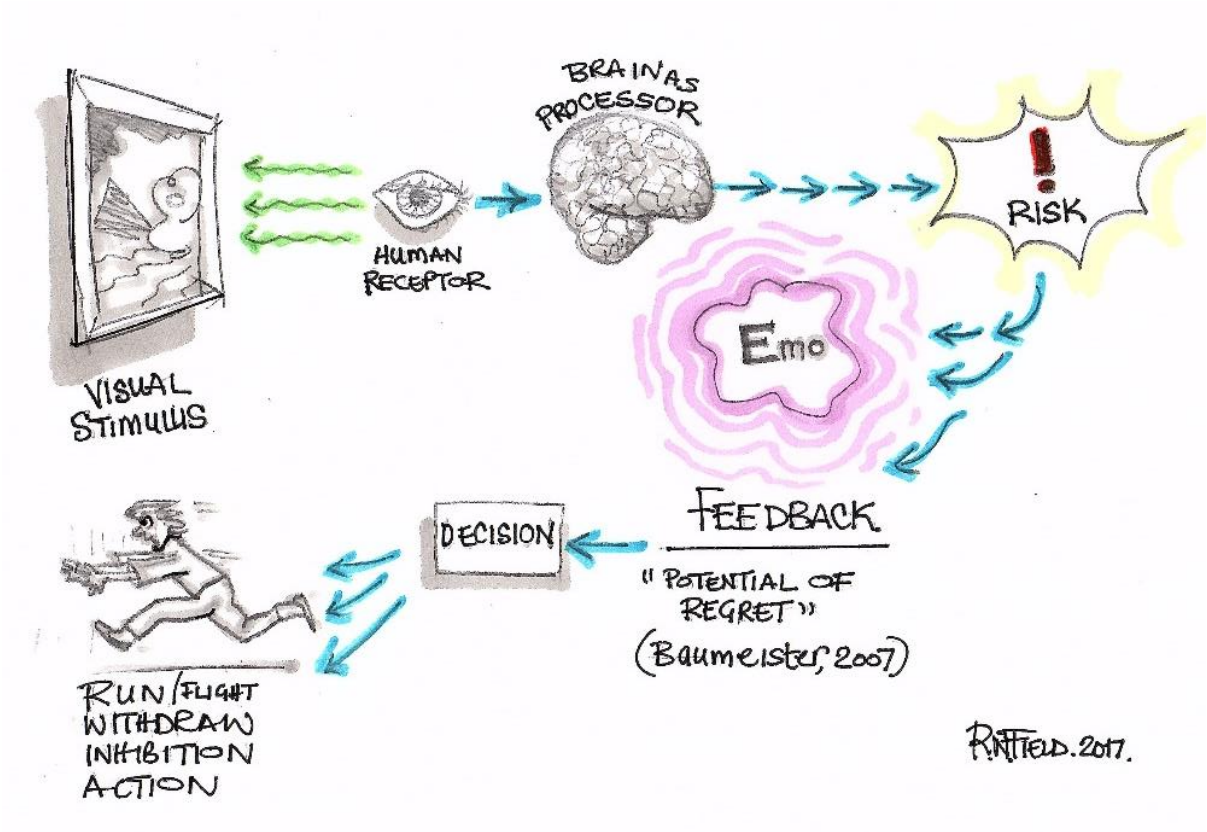

The proposed process in Figure 7.4. would suggest that art-science that stimulates emotions of sadness is likely to result in public withdrawal, inhibition (Gray, 1990) and inaction, whereas anger will lead to physical and verbal action as protest…an approaching, proactive response.

Fig 7.4. Author's proposed process of how certain emotions translate into behaviour.




However, both sadness and anger emotions might relate to a response of fear of 'potential regret' (Baumeister, 2007), and a response of fight/flight, withdrawal, inhibition and action. It is debatable whether regret is an emotion or a state of mind, a rational, cognitive state. Figure 7.5. attempts to illustrate Baumeister's (2007) theory.

Fig.7.5. Author's illustration of Baumeister's (2007) theory on feedback and regret.




Decision research has only recently started to take seriously the role of emotions in choices and decisions. Regret is the emotion that has received the most attention and has led to a new theory called decision justification theory (DJT). It is recognised that making a choice is an intensely emotional experience. Regret is the emotion that has received the most research attention from decision theorists. Studies showed that a bad outcome resulting from action seemed to be more regrettable than the same bad outcome when it was the result of inaction, and that when looking back, people experience more regret over paths not taken. In other words, the public regret inactions more than actions in the short run as well as the long run. There is, however, good evidence that choices are influenced by anticipated regret, and that such anticipation is affected by whether one expects to learn from the outcomes of un-chosen options (Zeelenberg, 1999). The emotional side of decision making is clearly important, but researchers are only now starting to understand it. The research on how people feel in and about the decision-making process is in its infancy. As researchers improve their understanding of regret and other decision-related emotions, people should be able to improve their choices, and their feelings

about the consequences of those choices. This understanding could influence climate change communication and engagement policy (Connolly & Zeelenburg, 2002).

The Stimulus, in whatever art-form acts as alchemy in the brain to generate a reaction. This reaction is made of emotions which might result from a perceived risk of regret. From this a decision is made to act, which could take the form of flight, withdrawal, inaction or indeed positive action, as an attempt to avoid the emotion of regret.

In a similar way, contemporary art, especially art that overtly engages publicly with sustainability and activism, appeals to its viewers to think for themselves and is premised on critical and creative thinking (unlike applied art such as fashion, design, and advertising). Art in this context is not complete until it involves someone to experience it, and one of the main concerns of contemporary artists is to include the viewer as an active participant in the work rather than a passive observer. As an example, Danish artist Olafur Eliasson explores our perception of the natural world through installations and sculptural works, and makes his viewers aware of themselves sensing and feeling when the viewer stops to consider what it is they are experiencing. Art can traverse a realm of uncertainty and present ambiguities and possibilities to engage viewers in a process of speculation and interpretation, and enables the possibility of immediate discussion (Duxbury, 2010).

One thing is for certain, and that is the public are far from indifferent and ambivalent when it comes to responding to art-science within the context of climate change. They have ideas and views to express. The indications from field research data is that public empowerment is likely to result in positive developments within climate change adaptation, as opposed to a growing fear of regret.

### 7.2.4. Use and recognition of familiar symbols and icons.

With the increase in international travel and trade, there is a growing need to communicate with people who do not understand the language of the country they are in. Perhaps the best examples of this are signs in international airports and information on dashboards of cars. In both cases the intent is to provide information accurately and quickly without using words. The use of symbols is one of the most popular ways of trying to meet these requirements. Symbols

first appeared as paintings or carvings on caves and stone walls as early as 50 000 BC, with the first depiction of humans dating back about 11 000 years (Boersema, *et al*., 1998).

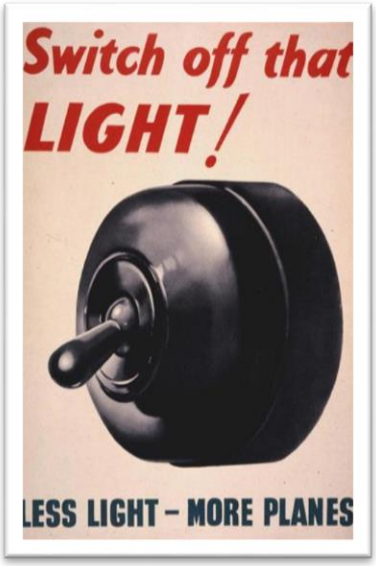
There are psychological processes involved in recognizing and understanding signs and icons. Interpretation of concrete symbols can recruit resources involved in interpreting the real world. Abstract symbols invoke referents only at the conceptual level, whereas concrete ones invoke specific objects or exemplars. The messages in both these examples in Figure 7.6. and 7.7. are lucid, but necessarily rely on the audience having some understanding of climate change impacts. Artistically, they use abstract representation of human beings and this approach could be said to ensure that they are inclusive and not discriminating. They are ambiguous to a degree which allows for diversity.

The use of logos/symbols/icons such as these is so popular nowadays that the public might confuse one with another, and not experience the maximum impact in terms of message or psychological register. A search online for logos will prove this point. Nevertheless, their effectiveness is potentially great and relies not simply on good graphic design, but also exposure to the target audience via effective marketing strategies. There remains scope for the use of logos within public engagement.

Fig.7.6. Environmental affairs: Republic of South Africa (left)
Fig.7.7. Rhian Field ART, (2013) (right)


The example in Figure 7.8. is what one might categorize as a public engagement logo makes use of one simple and recognised symbol, and could be updated, modified, to be used today. This type of graphic serves as useful within education, at all levels and within all age groups. One could suggest that a well-designed logo acts as an aid memoir, and can be easily recalled by the student/audience as a stimulus towards remembering more comprehensive information and messages.

Fig.7.8. "*Switch off that light!"* World War II Poster




When participants drew their representations of climate change impacts within the confines of the relatively small box, in the field research questionnaire, they recalled symbols, from memory, such as the sun, people, animals, plants, buildings and the globe, etc., to communicate their ideas. The summary of participants' drawings content themes is represented in chart-form in Chapter 6, *The opportunity for art-science within climate change adaptation*, Figure 6.17.

### 7.2.5. Through relating and imagining.

It is reasonable to suggest that through the drawing process, participants further-developed their perceptions and attitudes towards global warming and climate change, whilst at the same time becoming more aware of their lack of understanding or clarity on the subject. Furthermore, the cognitive process is likely to have stimulated emotions such as anxiety, sadness, anger, frustration etc. It prompts the individual to ask inwardly *"so what do I think/feel about all this; and what part do I play?"* It brings the topic and the questions to the forefront of their minds, if only for a brief moment, before becoming distracted by other events around them.

Furthermore, by contributing their own ideas and hearing their own words, they are buying into a sense of efficacy, empowerment and ownership of the climate change predicament. Their involvement is sharing ideas is essentialy active citizenship. This cognitive and emotional engagement has the potential to help shape policy and drive change.

In using their imagination to solve the clues in a picture and unravel the story line, as participants were observed to do with Section 3 and 5 of the field research experiment, they engaged with the question surrounding the context, e.g. what are the impacts, who/what will it affect, what's in store, who is to blame, how do I feel? Etc.

## 7.3. Summary

An invitation to the public to make relative value judgements about art and science in general, share opinions and cast their votes, could have the effect of signing them up for membership, metaphoriclally speaking; in other words re-enforcing their position as stakeholders and bringing them on-board as communities with a vested interest in climate change adaptation. This might be an optimistic outlook, however, if there is even a spark of possibility, it might be worth experimenting with further, in the name of climate change adaptation.

Apart from the benefit of insights, the opporrtunity for subjective interpretation is in new thinking and innovation…from a collective, public intelligence, vox populi, and the idea that larger groups of people make wiser decisions (Galton, 1907). If art-science can act as a stimulus for change, it can steer us towards adaptation. In the process of developing self-awareness through sensing and tuning-in to their feelings in response to artistic imagery, the public begin to acknowledge the imperative for change in behaviour. It could be the first step in moving away from a state of denial, and becoming accepting of the implications of climate change.

As well as offering the public the opportunity of solving the mysteries of abstract and highly ambiguous imagery, there is valuing providing cues by the use of recognisable symbols and icons, so that there is quick access to important, and meaningful themes and climate change information, providing reassurance where needed. Therefore, an emotive style of engagement is where the potential for art-science exists. Perhaps this brings us back to Medieval philosphers ideas around light, idea and reason, and the theory that emotion interacts with other domains of cognition (Dolan. 2002). When art-science can stimulate a response and reaction, it might even support the notion suggested in Chapter 3 that art can defy the limitations set by the notion of subjectivity, thereby *reaching parts that other methods cannot reach*.

# CHAPTER 8: CONCLUSION

If we understand how the public see and experience things (that affect them), we are more likely to be able to converse in the same language. It seems that art helps us to both understand, and to speak. The question-mark still hovers over who governs climate change, and what potential exists for the public to influence leadership, however, the findings of this research suggest that maybe this is the opportunity, and not for top-down communication of science knowledge regarding the need for climate change adaptation.

Within this research, art has acted as a scientific instrument. Science, although often fascinating to the lay man when presented in accessible forms, can sometimes be difficult to relate to, and might motivate the public through fear. In contrast, art empathises with human vulnerability by inspiring, entertaining and motivating through hopes, fears and values. It could be that the power of art lies in light, idea and reason, as was the thinking of medieval times. When visual art within a climate change context stimulates a strengthening of feeling, as was experienced within the field experiment, there is evidence of increased confidence and assertiveness in expressing thoughts. This progression could lead to a shift in behavior and a higher propensity for action. Additionally, opportunities for the public to participate are empowering, develop self-awareness, contribute to intellectual capital and can help with encouraging the public to buy-in to climate change adaptation initiatives.

The message coming through from this experimental research is that art has no value without the viewer, and that its value is enhanced in conjunction with environmental science. Furthermore, there is potential gain through the public's drawings connecting with *each other*. Each drawing is made by a single individual, and yet collectively they are a virtual community…a collective intelligence that lacks faith in the *political* leadership, and is perhaps seeking a different kind of representative.

Participants within this field research were conscious actors, communicating overtly through an artistic medium, to express their thoughts and feelings in relation to climate change impacts, using their *own* words. This interaction with art, within a context of environmental science, provided an insight into the potential for art-science collaboration to help us understand the world and make the world understood. The results show clear evidence of a common response to the visuals used in the experimental exhibition. This encouraging result demonstrates that

there is scope for art to be proactive in connecting the community with matters such as the natural environment and climate change adaptation. Further investigations are needed to establish how each set of emotions relate to motivation and action.

This research suggests there are benefits to be gained by tapping into collective intelligence (Lévy and Bononno, 1999) by adopting a sympathetic view of a relatively more complex social landscape, and how cultural shifts have produced a more questioning society who have the confidence to form their own opinions. Art-science provides the channel for voicing or conveying collective intelligence, and in doing so, it becomes a medium for sharing in a multi-dimensional manner, vertically and horizontally, to improve bottom-up and lateral communication within society. This is perhaps where small behaviour shifts can gather momentum.

Sophisticated systems referred to as collective intelligence, have the potential to project humanity into a new phase of its intellectual and social evolution. The creation of the new knowledge space is a direct result of new computer technologies such as hypertext[29]. This in turn makes a shared discourse or collective intelligence possible, which promotes the construction of intelligent communities in which our social and cognitive potential can be mutually developed and enhanced. This political philosophy reflects a form of human ecology (Lévy and Bononno, 1999).

Ogden's (1938) ideas about the "*undiscerning*" quality of aesthetic behaviour when linked with Ramachandran and Hirstein's (1999) more recent theories on the unconscious mind and the role of instinct, confirm that the task of getting to the crux of how art and the brain lead to motivation is not straight forward. When it comes to taste "*there is reason, even though the creature does not know it",* and we are merely creatures trying to know and understand other creatures' reasoning (Ogden, 1938), while art is the mission of humankind, trying to understand the world, and to make the world understood (Rodin, 1912).

The observation is that visual art and environmental science complement each other. One could say that overall, science brings discipline to art, and art brings challenge to science. Perhaps most pertinent is art's role in reminding us that science is most critical to humankind.

[29] A software system allowing extensive cross-referencing between related sections of text and associated graphic material.

But perhaps we need to study more closely why some societies make disastrous decisions. For example, how on earth could a society make such a disastrous decision as to cut down all the trees on which it depended as in the case of Easter Island? – however, if we assume that humankind survives into the next century, the public will most likely be as much astonished about our behaviour today, as we are astonished at the apparent mistakes of the Easter Islanders, whose short-sightedness brought about their extinction. Failures of group decision-making within societies is a phenomenon which can be influenced by conflicts of interest, failure to anticipate, failure to perceive and act on a problem, indeed to fail at solving it. Another possibility proposed is that a lack of prior experience of a problem indicates that the society and the decision-making group is not sensitized to the possibility. Short term memory and even failure to see a problem which is already under their noses are other possible explanations. The commonest circumstance under which societies fail to perceive a problem is when it takes the form of a slow trend concealed by wide up-and-down fluctuations, as is experienced in our society today with global warming. When it comes to behaviour, with the "*tragedy of the commons*" and "*the logic of collective action*" in mind, consumers need to recognize their common interests and to design, obey, and enforce prudent harvesting quotas themselves, for example. Perhaps a crux of success or failure as a society is to know which core values to hold on to, and which ones to discard and replace with new values (Diamond, 2011).

However, there is a danger that while the artist is used purely as a communicator of science facts, without the full conviction of the artist as to the relevance of the knowledge to humankind, and commitment by the scientist to the need to convey the message, any resulting artistic creation will fail to influence.

So, what of visual art's role within the communication of science knowledge? These experiments have shown that art can act as *interpreter* – helping to convey ideas or stress a point. In other words, it allows the public to have a voice to speak to others within the community and to government. It has acted as a *stimulus*, drawing-out gut reactions from participants, which have been expressed as a set of distinct emotions. We have seen how art can *challenge* the public to think critically about its environment by challenging their perception of reality e.g. through use of opposites, extremes, hypothesis, fantasy, irony, paradox and humour. The drawings have provided a clearer public perspective, answering the question as to their attitude and understanding of, (and relationship with) climate change. On

this basis, it would be reasonable to conclude that a collaboration between visual art and environmental science could serve as a catalyst for behaviour change.

Uniquely, this art-science approach to art-science collaboration research contributes creative-thinking, versatility and empathy within its design, analysis and interpretation. We have art, we have science, and we have art-science – metaphorically speaking, they are courting with a view to marriage and procreation. One view is that both art and science are about humankind trying to understand the world and to make our world understood, philosophically however, in the face of scientific fallibility, art reminds us that "*there is something else that we cannot know*" (Rodin, 1912).

**Reflections and future Research**

As a mature student, Rhian's decision to make this academic journey was driven by a passion to continue learning and developing her skills and understanding. She also considered it to be a great privilege, and an opportunity to develop her ideas and beliefs around art for science and humankind, having started on her independent art-science research path previously. Having qualified with a Bachelor of Science Honours Degree, and not having studied for a Masters Degree prior to commencing the PhD, she faced a very steep learning curve, especially in terms of carrying out research within the unfamiliar discipline of Geography (Arts) and academic writing. However, her previous experience in industry helped with a confident and efficient approach to project management, especially within the field research planning, execution and analysis.

Apart from needing to develop her research and academic writing skills, one of the main challenges within the project was experienced within the production of artworks which would satisfy the aims of the research. In most cases, they served their purpose, however the set of two paintings made to explore strength of composition unexpectedly proved the most challenging. This was because it was difficult to consciously paint a poor composition and at the same time replicate the elements of the other. Although the experiment may not have proved the value of compositional rules, it confirmed that the public engage in a personal way, relating subjectively in a way that is meaningful for them.

The Motivation Traits experiment produced predictable results and supported Bailey's (1970's) theory that most individuals fall between the motivation trait categories. What was quite exciting to the researcher was how well participants coped with questions which called upon their ability to hypothesize, relate and project themselves into the scenes depicted. This is an area within the experiment which could be worth developing, for further exploration, in relation to what makes people act/react, with reference to the work of Gray, (1990) and Beaumeister, (2007).

Although individual field research exercises were relatively simple ones, they called for participants to use rational, creative and self-reflective skills to respond to the visual stimuli and the invitation to draw, and was therefore quite challenging. The public communicated and illustrated their ideas willingly and with relative ease, despite being non-artists.

When it came to the questionnaire and the experiment question sheet, which were relatively comprehensive, participants were evidently happy to spend time responding to them, including extended time on the final request for their sketched ideas of climate change impacts. This came as an encouraging surprise.

One observation which should be noted, for similar field research in future, is that in many cases school pupils' initial response was to attempt to answer correctly, though this was not the aim of the exercise, and it was their subjective responses that were being sought. As researcher, it was necessary to reassure them that there was no correct answer and their own opinions were most important. The groups relaxed into assertive discussion once they had gained confidence, for the 30-40-minute exercise that followed the questionnaire. Although individual responses were desired, students were permitted to discuss the topic with their classmates. This resulted in some replication of ideas.

Some of the questions posed did not work as well as hoped in giving indications such as personality or motivation traits. It is suspected that people chose the descriptions that they believe made them look best within society/with peers and perhaps were not the best party to reflect on themselves. It relied on having a degree of self-awareness, so that if their friends or family had been asked to choose the answer that best describes how that person tends to respond/react/make decisions, they might have chosen different options, having a more objective view and experience. Regardless of this, what we have is a trend which indicates how people tend to perceive themselves or choose to see themselves, which could be useful in some

way because it relates to social norms, peer pressure and how one is received within communities. Artistic visuals might influence people differently depending upon how they choose to be seen in society.

The opportunities to further benefit from this path of exploration exist in the collection of more data of the same, especially among the younger public (under 18) who are influenced by teachers and guardians, as well as social media. This could amplify the public voice within climate change adaptation, by helping the public to be heard within, and beyond local communities.

Ogden's (1938) suggestion that "*an organism is directed in its environment by its needs of the moment"* has a bearing on the public's motivation to act today, and benefit in the future. Research needs to determine if this is indeed an accurate perspective on humankind, and if so, work towards looking at climate change adaptation through a different lens. Instead of trying to persuade the public to make changes for a better future, perhaps the spotlight should be on present times and public empowerment. The public clearly has an opinion.

Evidently, certain content (and this might also be influenced by their colour, hue, tone, contrast etc.), within images, consistently have more impact than others. It is not clear as to why this is, although Ramachandran and Hirstein's (1999) theories which explore exaggeration and caricature might be worth experimenting with.

One could say that the drawings acted as the public articulation of their understanding, beliefs and attitudes towards climate change impacts, in other words, the public voice. Their drawings and their responses were done independently of each other and so the next opportunity for learning and discovery might be in bringing their visual ideas together as a whole collective voice, and making them accessible, within the public arena.

Table 8.1. lists and categorises the proposed functions of art that have been assimilated from a review of literature (Chapter 3, "*Art and Human Behaviour*"), some of which have been explored within the experimental field research.

Table 8.1. Further areas for exploration within art and human behaviour (ref: Chapter 3).

| | | |
|---|---|---|
| | **Qualities of Art** | **Functions of Art** |
| | Unique rapport (heart and soul, mind, eye and hand) | Survey and surveillance |
| | Spiritual 'lift' | Educational |
| | Visualisation (from the mind) | Entrepreneurial |
| | Individual | Biological |
| | Resists destruction | Emotions management (emotional intelligence) |
| | Persuasive | Escapism (by 'inhabiting' the space created) |
| | Identity-defining | Expression / conveyance |
| | Stimulates subjective response | Communication – a language / culture |
| | Interdisciplinary | Regression (to childlike state) |
| | Universal | Persuasion and influence |
| | Exclusively Human | |
| | Non-conformist | **Mysteries of Art** |
| | | Uses Light and Rhythm |
| | **Applications of Art** | Consciousness / Unconsciousness |
| | Creation / Re-invention | Relies upon Instinct |
| | Stress relief) | Requires Rasa / essence |
| | Form 'Taste' (rules without reason) | Panders to 'Taste' |
| | Act as Catalyst, for 'eco-experiences' | Plays with emotion and intellect |
| | Hypothesizing | Inaccessible relationship with Brain |
| | Decision-making | |
| | | |
| | **Communications in Art** | |
| | Caricature or Exaggeration | |
| | Colour and Balance ('proper place') | |
| | Abstract / Representational | |
| | Evocative | |
| | Facilitates need to 'See' | |
| | Caters for Personality types and Motivation traits | |
| | | |

There is further scope for experimenting with the remaining proposed functions in a similar way, to understand their potential within an art-science collaboration.

# REFERENCES

Addison, P. (2010). *No Turning Back: The Peacetime Revolutions of Post-War Britain*. Great Britain. Oxford University Press Inc., New York. ISBN 978-0-19-219627-7. p.403

Advertisers Without Borders. (2011). *Just because you can't see it, it doesn't mean it's not there*. Online. Available at: http://www.awbnetwork.org/

Allen, P.; Hinshelwood, E.; Smith, F.; Thomas, R.; Woods, S.; (2014). *Emergence: Culture shift. How Artists are responding to Sustainability in Wales. Emergence*. UK. Volcano. Wales. Accessed online at file:///C:/Users/User/Downloads/CULTURE-SHIFT%20(2).pdf May 9th, 2016, 17:21 (no page number).

Atiku, J. (2006). *Artistic Engagement with Constitution-Making Processes: An intervention with Ewawo – The Awaiting Trial Persons*. Accessed online via Academia.eu 22nd January 2015. (no page number)

Bala, I. (1999). *Certain Welsh Artists: Custodial Aesthetics in Contemporary* Welsh Art. WALES. Poetry Wales Press Ltd (Seren).

Balm, R. (2000). *Expeditionary Art: An Appraisal*. USA. Geographical Review, Vol. 90, No. 4. pp585-602. Rutgers *Focus* Webpage – interview with Roger Balm, accessed online 5th April, 2016, 14:32:

Bamford, A. (2003). *The Visual Literacy White Paper*. Commissioned by Adobe Systems Pty Ltd, Australia.

Baumeister, R. F.; Vohs, K D. DeWall, C. N. Zhang, L. (2007). *How Emotion Shapes Behavior: Feedback, Anticipation, and Reflection, Rather Than Direct Causation*. PSPR, Vol. 11 No. 2, May 2007 pp.167-203 DOI: 10.1177/1088868307301033 © 2007 by the Society for Personality and Social Psychology, Inc.

Beard-Knowland, T. (2015). *Who's Killing Creativity Now?* Thought Piece. UK. Ipsos Connect. Ipsos Mori. Accessed online 16 Nov. 16; 15:02 (no page number)

Becker, Gary (1993) [1964]. *Human capital: a theoretical and empirical analysis, with special reference to education* (3rd ed.). Chicago: The University of Chicago Press. ISBN 0226.04119-0.

Belfiore, E. (2006). *The social impacts of the arts – myth or reality?* In: Mirza, M., ed. (2006). Culture Vultures: is UK arts policy damaging the arts? London: Policy, pp29-36.

Berger, J. (2008). *Ways of Seeing*. Great Britain. Penguin Books Ltd. pp8-10

Boersema, T.; Hoonhout, H.; Zwaga, H.; Stiff, P.; Ed. (1998). *Visual Information For Everyday Use: Design And Research Perspectives*. Taylor & Francis. Chapter 23. Accessed online, 07/05/17, 15:58. p286.

Bohnsack, R. (2009). *The Interpretation of Pictures and the Documentary Method.* Historical Social Research. Vol. 34, No. 2 (128), pp. 296-321

Born, G.; Barry, A. (2010) *Art-Science: From public understanding to public experiment.* Journal of Cultural Economy, Vol 3, No. 1, March 2010. UK. Taylor & Francis. ISSN 1753-0350 print/1753-0369 online/10/010103-17. pp103-119

Brown, M. (2015). Gormley climate change artwork shown for first time in the Guardian. The Guardian Online. March 6th, 2015, 12:50. (no page number).

Cape Farewell. (2013). ART/SCIENCE Collaborations, Bodies, and Environments http://artscience.arizona.edu/research-sites/cape-farewell (ref: Deborah Dixon and Sallie Marston) Accessed 19th April 2016; last updated Dec 2013. (no page number)

Capstick, S. B.; Demski, C. C.; Sposato, R. G.; Pidgeon, N. F.; Spence, A. Corner, A. (2015). Public perceptions of climate change in Britain following the winter 2013/2014 flooding. Cardiff University. Understanding Risk Research Group Working Paper 15-01.

Capstick, S., Pigeon, N., Whitehead, M. (2012*). C3W Public Perceptions of climate change in Wales*. Cardiff University and Aberystwyth University. http://c3wales.org/wp-content/uploads/2013/03/C3W-report-FINAL.pdf (no page numbers)

Carvalho, A; Burgess, J. (2005). *Cultural Circuits of Climate Change in U.K. Broadsheet Newspapers, 1985-2003*. Risk Analysis, Vol.25, No. 6, 2005. Society for Risk Analysis.

Centre for Alternative Technology (CAT), (2017). Zero Carbon Britain: Making it Happen. Toms, C; Hooker-Stoud, A; Shepherd, A. (eds). CAT Publications. UK. pp.173-181

Charvet, S. R. (1997) *Words That Change Minds: Mastering the Language of Influence*. USA. Kendall/Hunt Publishing Company. Iowa. pp.4-51

Clements, P. (2007). *The Evaluation of Community Arts Projects and the Problems with Social Impact Methodology*. UK. The Author. Journal Compilation. The Society of Authors Quarterly Journal. NSEAD/Blackwell Publishing Ltd. pp. 325-335.

Clifford, N. J., French, S., Valentine, G. (2010). *Key Methods in Geography*. CA. Sage Publications. ISBN: 978-1-4129-3508-1. p198.

Collier, P. (2010). *The Plundered Planet: Why we must – and how we can – Manage Nature for Global Prosperity*. Britain. Oxford University Press. Allen Lane (2nd ed).

Collier, P. (2013). *Exodus: How migration is changing our world*. Britain. Oxford University Press, pp.61-67. p175.

Connolly, T.; Zeelenburg, M. (2002). *Regret in Decision Making*. Department of Management and Policy, University of Arizona, Tucson, Arizona (T.C). The Netherlands (M.Z.) Volume 11; Number; 6, December 2002. pp212-216.

Corner, A. (2015). *12 Tools for communicating climate change effectively: 8. Communicate through images and stories*. UK. The Guardian Online, accessed 24th March 2016, at 10:51. http://www.theguardian.com/sustainable-business/2015/jul/06/12-tools-for-communicating-climate-change-more-effectively (no page number)

Cornwall, A., Jewkes, R. (1995). *What is Participatory Research*. Great Britain. Elsevier Science Ltd. Social Science and Medicine. Vol.41, No. 12, pp1667-1676. 1995.

Critchley, E. (2015). *THEY*. Video and sound installation. The 2013/14 Winter Floods and Policy Change, at University of Exeter. Online 05.09.17, 10:52 http://emmacritchley.com/films/they

Curtis, D. J.; Reid, N.; Ballard, G. (2012). *Communicating Ecology Through Art: What Scientists Think.* Canada. The Resilience Alliance. Ecology & Society 17(2):3. Accessed online 28 August 2014, 12:45. http://dx.doi.org/10.5751/ES-04670-170203. (no page number)

Damasio, A. R. (2006). *Descartes Error*. London. Vintage. p115.

Diamond, J. (2011). *Collapse: How Societies Choose to Fail or Survive*. England. Penguin Books Ltd. 978-0-241-95868-1. pp420-440, 486-525. pp420-440, 486-525.

Dockerty T. *et al*. (2004). *Visualising the potential impacts of climate change on rural landscapes.* UK. Elsevier Ltd. doi:10.1016/j.compenvurbsys. 2004.05.004. pp297-320.

Dolan, R. J. (2002). *Emotion, Cognition, and Behavior.* Science; 08 Nov 2002: Vol. 298, Issue 5596, pp1191-1194. DOI: 10.1126/science.1076358

Duxbury, L. (2010). *A Change in the Climate: New Interpretations and Perceptions of Climate Change through Artistic Interventions and Representations*. Australia. School of Art, Royal Melbourne Institute of Technology University. Published Online: 1 October 2010. http://journals.ametsoc.org/doi/abs/10.1175/2010WCAS1053.1. Accessed 15th Nov 2016; 15:39. (no page number)

Dzulkifli M.A., Mustafar M.F. 2012. *The Influence of Colour on Memory Performance: A Review*. The Malaysian Journal of Medical Sciences: MJMS. 2013;20(2): pp3-9.

Elkins, J. (2009). *Aesthetics and the two cultures: why art and science should be allowed to go their separate ways*. In Francis Halsall, Julia Jansen & Tony O'Connor (eds.), Rediscovering Aesthetics: Transdisciplinary Voices From Art History, Philosophy, and Art Practice. Stanford University Press. Exchange Limited. http://go.warwick.ac.uk/51721/

Elliot, A. J., Maier, M. A. 2007. *Colour and Psychological Functioning*. NY. Current Directions in Psychological Science October 2007 vol. 16 no. 5250-254. doi: 10.1111/j.1467-8721.2007.00514.x

Environmental affairs. Climate Action Now!: *Save Our Future* [LOGO]. Republic of South Africa. Climate Change and Air Quality Management. Accessed online, 07/05/17, 15:37 at https://www.environment.gov.za/projectsprogrammes/climatechange_airquality_management #background (no page number)

Erikson, T. (2001). *Intellectual capital: a human capital perspective*. Journal of Intellectual Capital, Vol. 2 Issue: 2, pp.127-135, doi: 10.1108/14691930110385919

European Commission; Directorate General Environment. March 2008. *Attitudes of European citizens towards the environment*. Special Eurobarometer 295/ Wave 68.2 – TNS Opinion & Social. Online: http://ec.europa.eu/public_opinion/archives/ebs/ebs_295_en.pdf [accessed 9/02/16, 15:34] (no page number)

Feldman, E.B. (1972). Varieties of Visual Experience: Art as Image and Ideal, Prentice – Hall Inc. et al, New York, p.19.

Galton, F. 1907. *Vox Populi, (The Wisdom of Crowds)*. UK. Nature, No. 1949, Vol. 75, 450-451 Accessed online 06/02/17, 18:58, at http://www.all-about-psychology.com/support-files/the-wisdom-of-crowds.pdf (no page number)

Gates, D. M. (1972). *Man and his environment: CLIMATE*. U.S.A. Harper & Row. Publishers, Inc. pp. 147-169

Gewin, V. (2013). *Interdisciplinarity: Artistic merit.* NATURE. UK. Mackmillan Publishers Ltd. 25th April 2013, vol 496. pp. 537-539.

Goethe, J. W. von. (1910). *Theory of Colours*. Online.
http://www.openculture.com/2013/09/goethes-theory-of-colors-and-kandinsky.html
28.08.17. 15:47. (no page numbers)

Goldstein, K. 1942. Some experimental observations concerning the influence of colors on the function of the organism. U.S. Occupational Therapy. 1942, 1, pp147-151.

Gombrich, E. H. (2000). *The Uses of Images: Studies in the Social Function of Art and Visual Communication*. London. Phaidon Press Limited. p264

Gray, J. 1990. *Brain Systems that Mediate both Emotion and Cognition*. Cognition and emotions. Taylor Francis Online Vol. 4, Iss. 3, 1990. pp269-288

Green, N. E. (circa.1880). *Hints on Sketching From Nature*. London. George Rowney & Co. Part 1; Chapter XII – "On Composition", pp. 41-48.

Greene, T.C., Bell, P.A., Boyer, W.N. 1983. *Coloring the environment: Hue, arousal, and boredom*. Collorado. Bulletin of the Psycho nomic Society 1983,21 (4), pp253-254

Greenmuseum. (2010) *What is environmental art?* U.S.A. Online. (no page number)

Grimes, A., and Doole, I. (2010). *Exploring the Relationships Between Colour and International Branding: A Cross Cultural Comparison of the UK and Taiwan*. Journal of Marketing Management Vol. 14, Iss. 7,1998. pp799-817

Harari, Y. N. (2014). *Sapiens: A Brief History of Humankind*. London. Harvell Secker. pp27,41.

Hassan, Z. (2014) *The Social Labs Revolution: A new approach to solving our most complex challenges.* U.S.A. Berret-Koehler Publishers, Inc. p19

Haussamen, B. (2014). *Creativity: A Survival Tool or a Higher Gift?* 3.8 Billion Years. Viewed 1st October 2015. http://threepointeightbillionyears.com/2014/01/06/creativity-a-survival-tool-or-a-higher-gift/ (no page number)

Hawkins, H. (2011). *Dialogues and Doings: Sketching the Relationships Between Geography and Art.* Geography Compass, 5: pp464–478. doi: 10.1111/j.1749-8198.2011.00429.x

Hawkins, H. (2013). *For Creative Geographies: Geography, Visual Arts and the Making of Worlds*. (Vol. 9). Routledge. p.28.

Hawkins, H. (2013). *Geography and art. An expanding field: Site, the body and practice.* Progress in Human Geography. UK. Sage Publications. Online 7 March 2014, 11:17. Available at http://phg.sagepub.com/content/37/1/52 p52-71

Healey, C. G; Enns, J. T. 2002. Perception and Painting: A Search for Effective, Engaging Visualisation. IEEE Computer Graphics & Applications. p10-15 http://dio.sagepub.com/content/55/1/84.short?rss=1&ssource=mfc

Hulme, M. (2013). *Why We Disagree About Climate Change: Understanding controversy, inaction and opportunity*. USA. Cambridge University Press. 7th printing. ISBN 978-0-521-72732-7 Paperback

Humboldt, A. von. ed., 2008. *Essay on the Geography of Plants.* Trans. S. Romanowski. U.S.A. The University of Chicago.

I.E.P. Internet Encyclopaedia of Philosophy (2010). A Peer-Reviewed Academic Resource: *Medieval Theories of Aesthetics*. USA. University of South Carolina. (no page number)

Ingram, M. (2012). *Sculpting Solutions: Art–Science Collaborations in Sustainability*. UK. Environment: Science and Policy for Sustainable Development. Vol. 54, Iss. 4, 2012. Online, 2/11/2013. pp24-34

Jach, A. (2010) *Elusive, fleeting, mysterious: on drawing and painting* [Creative non-fiction.] [online]. Antipodes, Vol. 24, No. 1, June 2010: 76-87.

Availability:<https://search.informit.com.au/documentSummary;dn=81114271026;res=IELAPA> ISSN: 0893-5580.

Joffe, H. (2008). *The Power of Visual Material: Persuasion, Emotion and Identification.* London. Sage Publications. Copyright of UNESCO 2008. DOI: 10.1177/0392192107087919 Accessed online 21st April 2016. pp84-93

Jones, R. A.; Pykett, J.; Whitehead, M. J. (2013) *Changing Behaviours: On the Rise of the Psychological State.* UK. Edward Elgar Publishing Limited. Accessed online March 12, 2018.

https://www.researchgate.net/publication/270589948_Changing_Behaviours_On_the_Rise_of_the_Psychological_State

Kendel, E. (2016). *How Art Can Inform Brain Science and Vice Versa*: *Reductionism may be the key to bridging the gap between the humanities and the sciences*. U-Tube Video - Eric Kendel: *How Your Brain Finishes Paintings*. USA. The Scientist Magazine. September 1, 2016. Accessed online 9th September 20126, 15:28. http://www.the-scientist.com/?articles.view/articleNo/46937/title/This-is-Your-Brain-on-Art/ (no page number)

Klockner, C. (2017). *Climate change and the Visual Arts*. Contemporary Arts Practice. University of Hertfordshire. Online 20/06/17; 12:29 (no page number)

Leonardo http://leonardo.info/isast/isastinfo.html. 2017.

Lévy, P., & Bononno, R. 1999. *Collective intelligence: Mankind's emerging world in cyberspace*. U.S. Perseus Publishing. ISBN:0738202614. pp13-19, 163, 229-230

Lovejoy, A. and Hawkins, H. (2009). *Insites: An artists' book*. Penryn: Insites Press. (no page number)

Manzo, K. (2010). *"Beyond Polar Bears? Re-envisioning climate change".* Wiley. Meteorological Applications, 17(2), pp196-208.

Manzo, K. (2012). *Earthworks: The geopolitical visions of climate change cartoons*. UK. Elsevier Ltd. Political Geography 31 (2012) pp481-494.

Marshall, G. (2014). *Don't Even Think About It: Why our brains are wired to ignore climate change.* U.S.A. Bloomsbury USA. ISBN: 978-1-62040-133-0. pp26-35

Marshall-Moullin, D. (2015). *Submerged*. Series of Portraits. University of Exeter. https://www.davidmansellmoullin.com/submerged

Marston, S; De Leeuw, S. (eds) (2013) *Creativity and Geography: Toward a Politicized Intervention*. The Geographical Review 103(2): April 2013.U.S.A. the American Geographical Society of New York. pp iii-xxvi

Mascalo, M. F., Fischer, K. W. (2010). *The Dynamic Development of Thinking, Feeling, and Acting over the Life Span*. The Handbook of Life-Span development. Wiley Online Library. Published Online: 20 SEP 2010. DOI: 10.1002/9780470880166.hlsd001006. (no page number)

Matarasso, F (1996). *Defining Values: Evaluating Arts Programmes*. Working Paper. (Comedia, Bournes Green, Stroud). pp1-24

Matarasso, F. (1997). *Use or Ornament? The Social Impact of Participation in the Arts* (Comedia, Bournes Green, Stroud). pp1-84

Mathers, A. (2012). *How Not Being Creative is Harming Your Very Survival*, Red Lemon CLUB. Viewed 1st October 2015. http://www.redlemonclub.com/motivation/how-not-being-creative-is-harming-your-very-survival/ (no page number)

Mc.Innes, R. Benstead, S. (2013). *Art as a tool in support of the understanding of coastal change in Wales*. UK. The Crown Estate 106 pages.

McCrann, G. E. (2009). *Government Wartime Propaganda Posters: communicators of Public Policy*. Behavioural & Social Sciences Librarian. Volume 28, 2009 – issue 1-2.

Mead, M. (1959). *Education in the Age of Science: Closing the Gap between the Scientists and the Others*. USA. Daedalus, Vol. 88, No. 1. pp139-146.

Merli, P. (2004). *Evaluating the social impact of participation in arts activities*. *A critical review of Francois Matarasso's Use or Ornament?* Glasgow. Variant vol 19. February 20, 2014 12:14. pp107-118

Miles, M. (2014). *Shock, Awe and Ellipsis: art and climate change.* UK. ixia, the Public Art Online Think Tank; 6th Feb 2014. Online. (no page numbers).

Miller, I. A. (2014). *Colliding Worlds: How Cutting Edge Science is Re-defining Contemporary Art.* USA. W. W. Norton & Company Ltd. pp.342,346,347.

Mills, P. R.; Tomkins, S. C.; Schlangen, L. J. M. (2007). *The effect of high correlated colour temperature office lighting on employee wellbeing and work performance.* UK. Journal of Circadian Rhythms. 11 January 2007. DOI: 10.1186/1740-3391-5-2 (no page number)

Montanez, A. (2015). *Art Can Highlight Climate Change, But Where is the Data?* Scientific American. November 27, 2015. Online 20/06/17; 12:37 (no page number)

Moore, S and Tickell, A (2014) *The arts and environmental sustainability: an international overview*, D'Art Topics in Arts Policy, No. 34b, Julie's Bicycle and the International Federation of Arts Councils and Culture Agencies, Sydney. (no page number)

Mower, T. 2012. *Climate change in the curriculum: Are all young people informed and inspired?* Earth & E-nvironment, 8: pp 1-37 University of Leeds Press. ISSN 1744-2893 (Online) http://www.see.leeds.ac.uk/misc/ejournal/Issue%208%20articles/8,%201-37.pdf [Accessed 9/02/16, 16:58] (no page numbers)

Muhamad, N. (2016). *Art is A Lie That Makes Us Realize the Truth*. ACADEMIA. 1112021040 / V A (no page number)

Neal, L. (2015). *Playing for Time: Making art as if the world mattered*. London. Oberon Books. p48.

Neidderer, K. and Roworth-Stokes, S. (2007). *The Role and Use of Creative Practice in Research and its Contribution to Knowledge*. UK. University of Wolverhampton. Accessed Online 15th April 2016, 16:19 at http://niedderer.org/IASDR07SRS.pdf. pp1-18

Newman, T; Curtis, K; Stephens, J. (2003) *Do community-based arts projects result in social gains? A review of the literature*. UK. Community Development Journal Vol38 No 4 October 2003, pp310-322.

NHS Online. *Seasonal Affective Disorder* (SAD). http://www.nhs.uk/conditions/Seasonal-affective-disorder/Pages/Introduction.aspx. 7 April 2014, 12:54 (no page number)

Nicholson-Cole, S. A. (2005). *Representing climate change futures: a critique on the use of images for visual communication*. UK. Elsevier Ltd. doi:10.1016/j.compenvurbsys.2004.05.002 pp255-273

Nicholson-Cole, S.A. (2004). *Imag(in)ing climate change: exploring people's visual imagery, issue salience and personal efficacy*. Unpublished PhD Thesis. School of Environmental Sciences, University of East Anglia, UK.

NOAA. (2017). Temperature Anomalies.

O'Neill, S. J. (2012). *On the use of imagery for climate change engagement*. UK. Elsevier Ltd. Global Environmental Change 23 (2013) pp413-421. Accessed online 14 February 2014, 14:50. http://dx.doi.org/10.1016/j.gloenvcha.2012.11.006

O'Neill, S. J. (2013). *Image matters: Climate change imagery in US, UK and Australian newspapers*. UK. Elsevier Ltd. Geoforum 49 (2013) pp10-19. Accessed online 14 February 2014, 16:09. http://dx.doi.org/10.1016/j.geoforum.2013.04.030

O'Neill, S. J. and Nicholson-Cole, S. (2009). *Fear won't do it: promoting positive engagement with climate change through imagery and icons*. Science Communication, 30 (2009), pp. 355–379

O'Neill, S. J., Smith, N. (2013). *Climate Change and Visual Imagery*. UK. John Wiley & Sons, Ltd. WIREs Clim Change 2014, 5:73-87. doi: 10.1002/wcc.249 pp73-87

O'Neill, S. J.; Boykoff, M.; Niemeyer, S.; Day, S.A. (2012). *On the use of imagery for climate change engagement.* Global Environmental Change 23 (2013) pp413-421. Elsevier Ltd.

Ogden, R. M. (1938). *The Psychology of Art*. USA. Charles Scribner's sons - New York pp.4-5; pp.20-30.

Ointment, (2005). Eli Events, Bedd Morris, Preseli Hills. Wales. Accesssed online April 1016 at http://www.ointment.org.uk/ev_eli.html (no page number)

Ornithology Magazine, British Trust for Ornithology BTO. "*Science and Art: Artists to Africa*". July-August 2014, issue 310, pp.12-14.

Park, A., Bryson, C., Clery, E., Curtice, J. and Phillips, M. (eds.) (2013). *Social Class: The role of social class in shaping social attitudes*. British Social Attitudes: the 30th Report, London: NatCen Social Research, available online at: www.bsa-30.natcen.ac.uk p13

Pearson, M., Gill, G., Scanlon, T. (2002). *Chapter 4: Emotions: Thinking, Feeling and Acting. Looking out, looking in*. Tenth Ed. Powerpoint, accessed online 28.03.2017, 14:01. (no page numbers).

Ramachandran, V. S. Hirstein, W. (1999) *The Science of Art: A Neurological Theory of Aesthetic Experience*. USA. Journal of Consciousness Studies, 6, No. 6-7, 1999, pp.15-5.

Rankin Poore, H. (1977). *Pictorial Composition: An Introduction*. New York. Dover Publications Inc. Revised ed. (1 April 1977). (no page number)

Reed, M. (2008). *Stakeholder participation for environmental management: A literature review*. UK. Elsevier. doi:10.1016/j.biocon.2008.07.014. Accessed online 25th April 2017. 14:55. pp2417-2431

Rees, R. (1976). John Constable and the Art of Geography. USA. American geographical Society. Geographical Review. Vol. 66, No. 1 (Jan.,1976), pp.59-72. DOI: 10.2307/213315

Reynolds, Vernon. (1980). *The Biology of Human Action: The Limits of Flexibility*. 2nd. Edition. California. W. H. Freeman & Co Ltd. pp.233-251, pp.258-259.

Richmond, S. (1984). *The Interaction of Art and Science*. UK. Leonardo, Vol. 17, No. 2 pp81-86.

Roberts, E (2015). *Why are the baby boomers desperate to make millennials hate ourselves?* Society. UK. The Guardian. 4th September 2015. (no page number)

Rodin, A; Guesell, P, (1912). *Art*. Cambridge, U.S.A. Trans Mrs Romilly Fedden. Small, Maynard & Company. pp175-245

Rose, G. (2007). *Visual Methodologies: an introduction to the interpretation of visual materials.* 2nd Ed. London. Sage Publications Ltd. ISBN 978 1 4129 2191 6 (pbk)

Ruddock, J., Macklin, M. J., Harvey, J. (2013). *SciArt: The confluence of art and science in conveying the uncertainties of climate change*. UK. Aberystwyth University Symposium. (no page number)

Ruhter (artist). "*Technically no-one can touch him – but he has nothing to say*" The New Yorker Magazine, Inc. (1950-55). The New Yorker 1950-55 Album. U.S. The Murray Printing Company. (no page number)

Saleem Khan, A. Ramachandran, N. Usha, I. Arul Aram, and V. Selvam. (2012). *Rising sea and threatened mangroves: a case study on stakeholders, engagement in climate change communication and non-formal education.* International Journal Of Sustainable Development & World Ecology Vol. 19, Iss. 4,2012. Pages 330-338. Accessed online: 25rh April 2017. 14:14. http://dx.doi.org/10.1080/13504509.2011.650230 (no page numbers).

Satyendra Singh, (2006) "*Impact of color on marketing*", Management Decision, Vol. 44 Issue: 6, pp.783-789, https://doi.org/10.1108/00251740610673332

Saussure, F. (2011). Course in General Linguistics. New York. Columbia University Press. Trans. Wade Baskin; Ed. By Peny Meisel and Hain Saussy. p23

Schroeder, H. W. (1996). *Ecology of the Heart: Understanding How People Experience Natural Environments*. U.S. Natural Resource Management: The Human Dimension. In A. W. Ewart (ed). Boulder, CO: Westview Press. Chapter 2. pp13-26

Selovey, P. Grewal, D. (2005). *The Science of Emotional Intelligence*. USA. Current Directions in Psychological Science 14: 281 DOI: 10.1111/j.0963-7214.2005.00381. pp.281-285.

Shaie, K. W. 1966. *On the Relation of Color and Personality*. U.S. Journal of Projective Techniques & Personality Assessment. Vol. 30; No. 6. pp512-522

Sheppard, S.R.J. (2005). *Landscape visualization and climate change: the potential for influencing perceptions and behaviour*. Elsevier Ltd. doi:10.1016/j.envsci.2005.08.002 pp637-654

Shultz, T. W. (1961). *Investment in Human Capital*. U.S. The American Economic Review. Vol.51, No.1 (Mar., 1961), pp.1-17.

Sternberg R. J.; Lubart, T. I. (1991). *An Investment Theory of Creativity and Its Development.* Human Development. 1991;34:1-31 pp1-31

Strengers, Y; Maller, C. ed. (2015). *Social Practice, Intervention and Sustainability: Beyond Behaviour Change.* ed. NY. Routledge.

The Wellcome Trust. (2015). *Public Engagement for Researchers: Working with artists*. Blog. Accessed online 23rd June 2015 at https://blog.wellcome.ac.uk/2013/12/18/public-engagement-for-researchers-working-with-artists/ (no page numbers)

The Wellcome Trust. (2016) *Engagement with your research*. Accessed online 21st April 2016, 15:00. http://www.wellcome.ac.uk/Funding/Public-engagement/Engagement-with-your-research/Support-and-resources/Arts/index.htm (no page numbers)

Thomas, G.; Durant, J. (1987). *Scientific Literary Issues and Perspectives: Why Should We Promote the Public Understanding of Science*? UK? A Journal of Research in Science, Education and Research. pp1-14

Tolia-Kelly, D.P. (2011). *The geographies of cultural geography II: Visual culture*. Durham, U.K. Sage Publications. Progress in Human Geography. Online 7 March 2014. Available at http://phg.sagepub.com/content/36/1/135 (no page numbers)

Tooth, S., Viles, H.A., Dickinson, A., Dixon, S.J., Falcini, A., Griffiths, H.M., Hawkins, H., Lloyd-Jones, J., Ruddock, J., Thorndycraft, V.R. and Whalley, B., (2016). *Visualizing geomorphology: improving communication of data and concepts through engagement with the arts*. Earth Surface Processes and Landforms, 41(12), pp.1793-1796.

Townsend, C., Shu, S.B. (2010) *When and how aesthetics influences financial decisions.* Journal of Consumer Psychology, Vol. 20, No. 4. (October 2010), pp.452-458.

Trumbo, J. 2000. *Essay: Seeing Science. Research opportunities in the visual Communication of Science. Science Communications*, Vol. 21 No. 4, June 2000 379-391. 2000 Sage Publications, Inc. pp379-391

Turner, J. C., Oakes, J. P., Haslam, A., McGarty, C. (1992). *Self and collective cognition and social context*. Department of Psychology. Australian National University Personality and Social Psychology Bulletin. NJ, Vol.20, issue 5; 7-10 May 1992. pp454-463

van Dijk, T. A. 2006. *Ideology and discourse analysis*. Journal of Political Ideologies. Volume 11, Issue 2, 2006. DOI: 10.1080/13569310600687908. pages 115-140. Routledge. Taylor & Francis Group. pp1-28

van Dijk, T. A. 2009. *Society and Discourse: How Social Contexts Influence Text and Talk.* Cambridge University Press. ISBN 0521516900, 9780521516907.

Webb, S. (2013). *Earliest artists were women claim researchers as study of cave paintings reveal majority of prints were from female hands*. Science & Tech, 09th October 1013. Mail Online. Accessed 16/08/2016; 13:11. http://www.dailymail.co.uk/sciencetech/article-2451442/Earliest-artists-women-claim-researchers-study-cave-paintings-reveal-majority-prints-female-hands.html#ixzz4HUr3Cmo5 (no page numbers)

Wilby, P. (2008). *Why capitalism creates a throwaway society*. New Statesman. UK. 28 August 2008. Online 19/06/17, 13:07. (no page number)

Willett, J. 1967. *The Theatre of Bertolt Brecht: A Study from Eight Aspects*. Third rev. ed. London: Methuen, 1977. ISBN 0-413-34360-X. (no page number)

www.ncdc.noaa.gov/monitoring-references/faq/anomalies.php

Yarwood, R. (2005). *Beyond Rural Idyll: Images, countryside change and geography*. Keynote Lecture. Geography. Geographical Association. Jstor Online, 11/06/2015. pp.19-34.

Zeelenburg, M. (1999). *Anticipated regret, expected feedback and behavioral decision making*. Journal of Behavioral Decision Making; Chichester 12.2 (Jun 1999): p93.

Zeki, S. (1999). *Inner Vision*. UK. Oxford University Press. pp.183-186; pp.201-208.

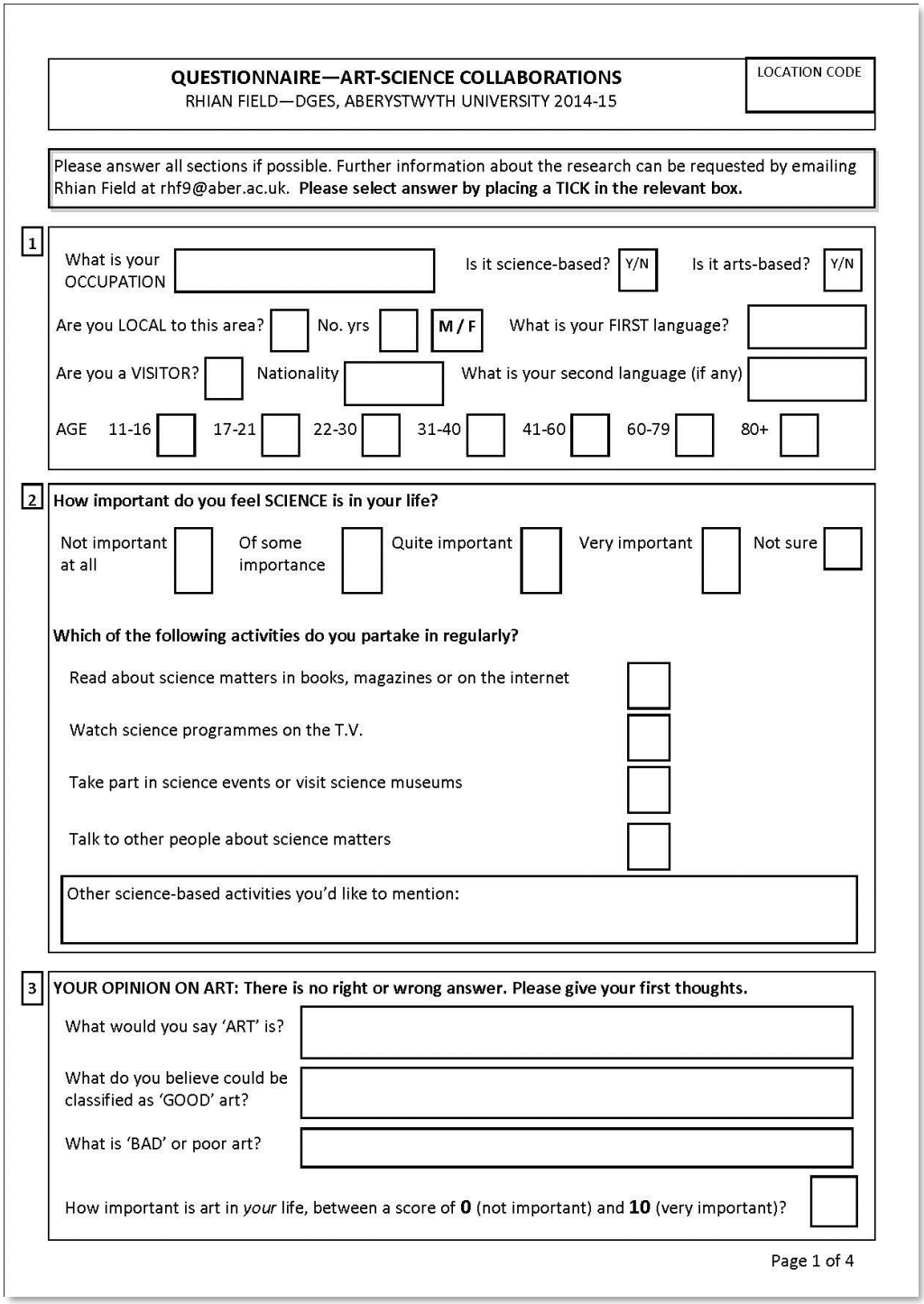
Zeki, S. (2012). *Neural Concept Formation and Art: Dante, Michaelangelo, Wagner*. USA. Iconic Turn - Felix Burda Memorial Lectures; 23 Aug 2012. (no page number)

Zen de Figueiredo Neves, G.; Gallardo, N. P.; Silva Vecchia, F. A. (2017). *A short Critical History on the Development of Meteorology and Climatology*. Climate 2017, 5(1), 23; doi:10.3390/cli5010023. Online 20/06/17, 19:58 (no page number)

Zimmer, R. (2003) *Abstraction in Art with Implications for Perception*. UK. Philosophical Transactions: Biological Sciences, Vol. 358, No. 1435, Jul 29. The Abstraction Path from Experience to Concept. Pp.1285-1291

# APPENDIX

## 1. Four-page Stand-alone Questionnaire:



**QUESTIONNAIRE—ART-SCIENCE COLLABORATIONS**
RHIAN FIELD—DGES, ABERYSTWYTH UNIVERSITY 2014-15

LOCATION CODE

Please answer all sections if possible. Further information about the research can be requested by emailing Rhian Field at rhf9@aber.ac.uk. **Please select answer by placing a TICK in the relevant box.**

1

What is your OCCUPATION | Is it science-based? Y/N | Is it arts-based? Y/N

Are you LOCAL to this area? | No. yrs | M / F | What is your FIRST language?

Are you a VISITOR? | Nationality | What is your second language (if any)

AGE 11-16 | 17-21 | 22-30 | 31-40 | 41-60 | 60-79 | 80+

2 **How important do you feel SCIENCE is in your life?**

Not important at all | Of some importance | Quite important | Very important | Not sure

**Which of the following activities do you partake in regularly?**

Read about science matters in books, magazines or on the internet

Watch science programmes on the T.V.

Take part in science events or visit science museums

Talk to other people about science matters

Other science-based activities you'd like to mention:

3 **YOUR OPINION ON ART: There is no right or wrong answer. Please give your first thoughts.**

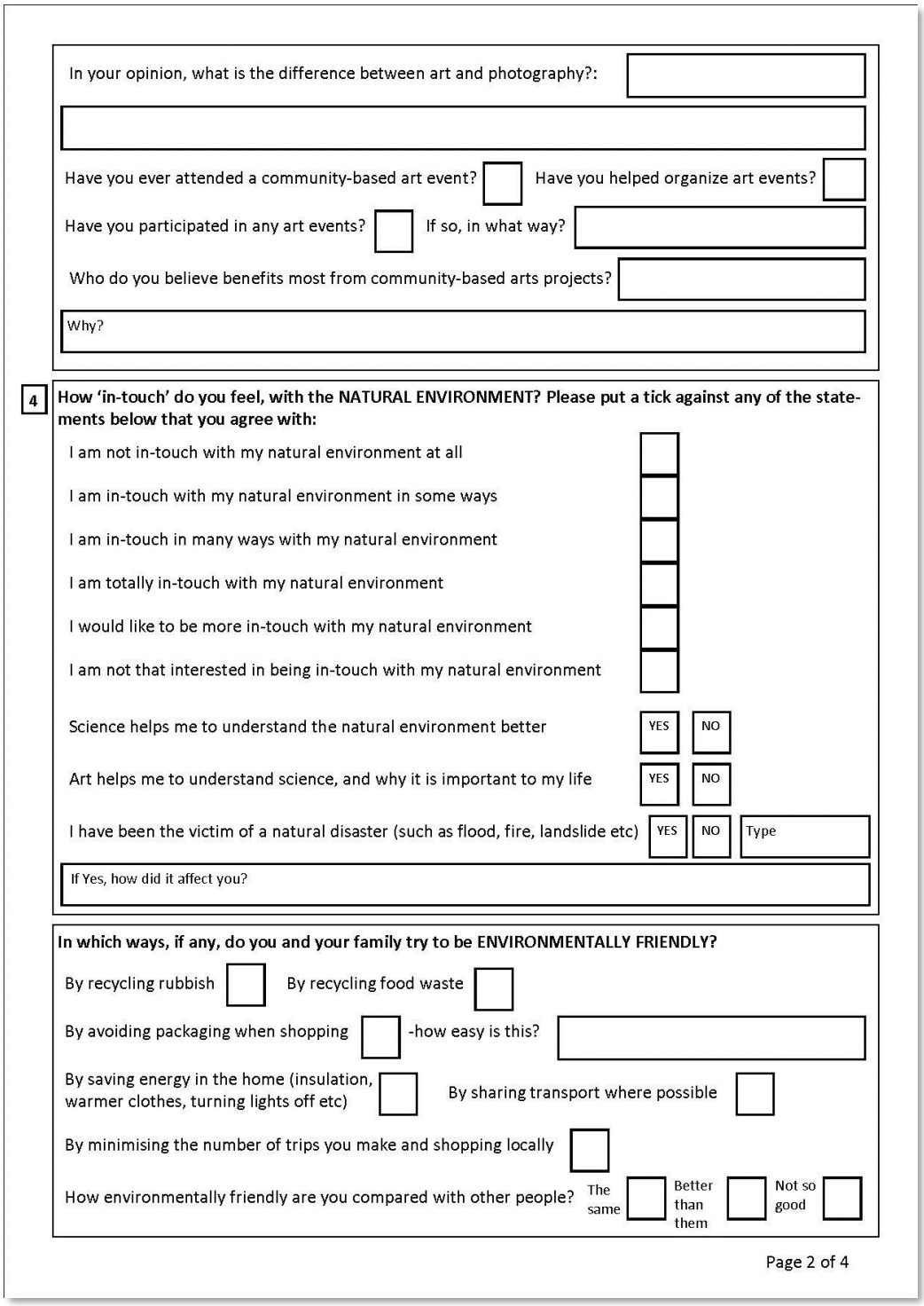
What would you say 'ART' is?

What do you believe could be classified as 'GOOD' art?

What is 'BAD' or poor art?

How important is art in *your* life, between a score of **0** (not important) and **10** (very important)?

Page 1 of 4



In your opinion, what is the difference between art and photography?:

Have you ever attended a community-based art event? ☐ Have you helped organize art events? ☐

Have you participated in any art events? ☐ If so, in what way?

Who do you believe benefits most from community-based arts projects?

Why?

4 **How 'in-touch' do you feel, with the NATURAL ENVIRONMENT? Please put a tick against any of the statements below that you agree with:**

- I am not in-touch with my natural environment at all ☐
- I am in-touch with my natural environment in some ways ☐
- I am in-touch in many ways with my natural environment ☐
- I am totally in-touch with my natural environment ☐
- I would like to be more in-touch with my natural environment ☐
- I am not that interested in being in-touch with my natural environment ☐

Science helps me to understand the natural environment better YES ☐ NO ☐

Art helps me to understand science, and why it is important to my life YES ☐ NO ☐

I have been the victim of a natural disaster (such as flood, fire, landslide etc) YES ☐ NO ☐ Type

If Yes, how did it affect you?

**In which ways, if any, do you and your family try to be ENVIRONMENTALLY FRIENDLY?**

By recycling rubbish ☐ By recycling food waste ☐

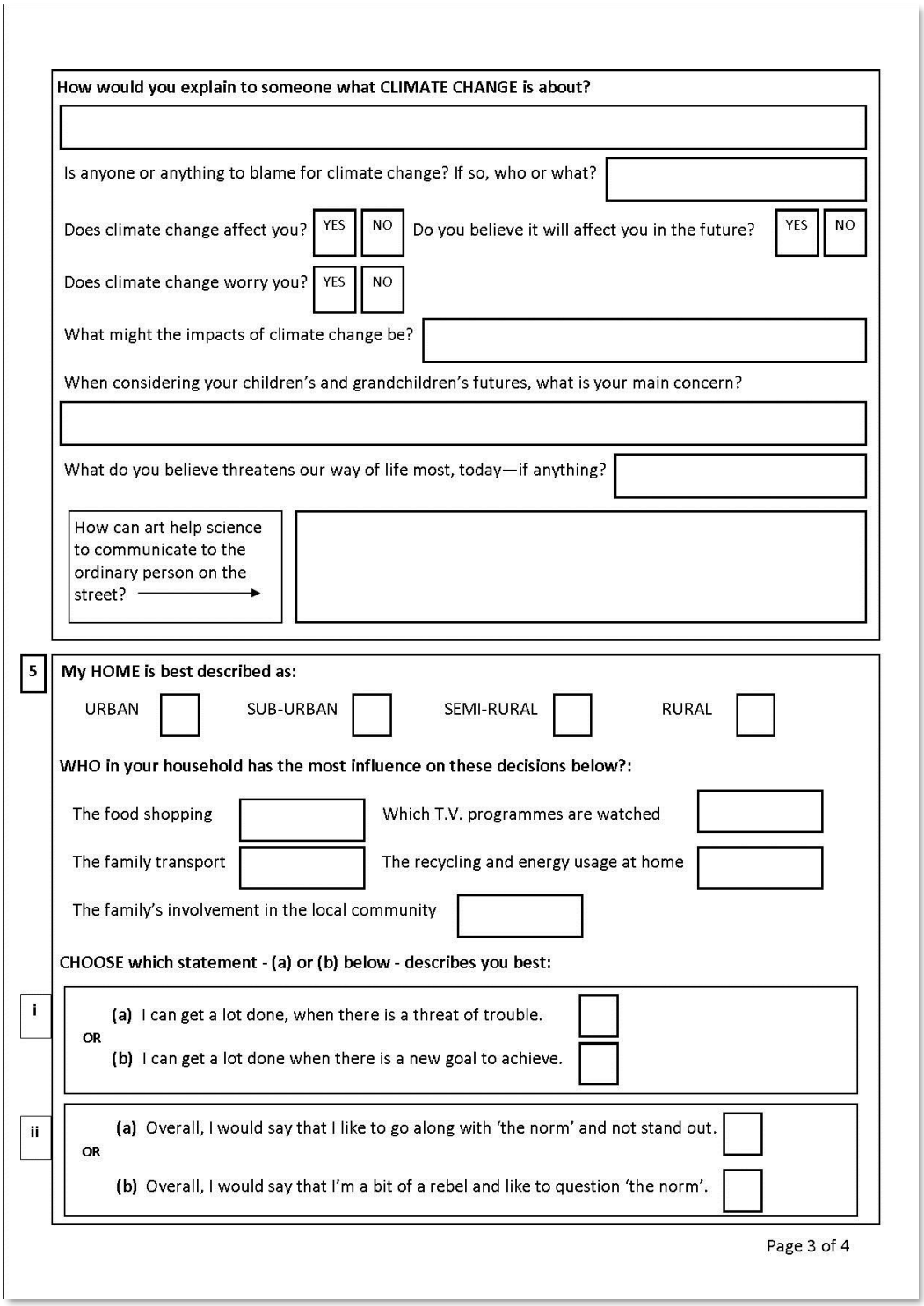
By avoiding packaging when shopping ☐ -how easy is this?

By saving energy in the home (insulation, warmer clothes, turning lights off etc) ☐ By sharing transport where possible ☐

By minimising the number of trips you make and shopping locally ☐

How environmentally friendly are you compared with other people? The same ☐ Better than them ☐ Not so good ☐

Page 2 of 4



**How would you explain to someone what CLIMATE CHANGE is about?**

Is anyone or anything to blame for climate change? If so, who or what?

Does climate change affect you? YES NO Do you believe it will affect you in the future? YES NO

Does climate change worry you? YES NO

What might the impacts of climate change be?

When considering your children's and grandchildren's futures, what is your main concern?

What do you believe threatens our way of life most, today—if anything?

How can art help science to communicate to the ordinary person on the street? →

5 **My HOME is best described as:**

URBAN SUB-URBAN SEMI-RURAL RURAL

**WHO in your household has the most influence on these decisions below?:**

The food shopping

Which T.V. programmes are watched

The family transport

The recycling and energy usage at home

The family's involvement in the local community

**CHOOSE which statement - (a) or (b) below - describes you best:**

i

**(a)** I can get a lot done, when there is a threat of trouble.

OR

**(b)** I can get a lot done when there is a new goal to achieve.

ii

**(a)** Overall, I would say that I like to go along with 'the norm' and not stand out.

OR

**(b)** Overall, I would say that I'm a bit of a rebel and like to question 'the norm'.

Page 3 of 4

iii

**(a)** Although I like to know what other people think, I will rely on my own judgement when it comes to how well I am doing. ☐

**OR**

**(b)** I need other people to let me know how well I am doing, otherwise I am a bit lost. ☐

iv

**(a)** I just get on with it…I like to get the job done! ☐

**OR**

**(b)** I am happy to wait and see what others do first, but am willing to join in once I've had time to weigh-up the situation. ☐

6. Imagine you had **£5,000** to invest in science and arts projects, how would you want to divide it?

**SCIENCE** projects ☐ **ART** projects ☐ **Use £ or %**

What symbol, sign, icon or wording comes to mind when you think of the impacts of CLIMATE CHANGE?
**Try to visualise it and make a simple sketch in the box below.**
In other words, what represents climate change—***for you***?

Use this box if you wish to explain your ideas.

Additional comments:

THANK YOU FOR PARTICIPATING IN MY RESEARCH TODAY
My contact details can be found on the Information Sheet provided.

Page 4 of 4

## 2. Field Experiment Question Sheet

ART-SCIENCE TORCH THEATRE EXHIBITION QUESTION SHEET May 2015

PLEASE ANSWER THE QUESTIONS BELOW, BEFORE MOVING ON TO LOOK AT THE EXHIBITION OF RESEARCH PAINTINGS - SECTIONS 1 - 5

1. Your gender (please tick)

☐ MALE

☐ FEMALE

2. Age (please tick)

| | | | |
|---|---|---|---|
| 11-16 | ☐ | 41-60 | ☐ |
| 17-21 | ☐ | 61-79 | ☐ |
| 22-30 | ☐ | 80+ | ☐ |
| 31-40 | ☐ | | |

3. Which of the two statements from each set below describes you best? Tick (a) OR (b) in each set.

(a) ☐ I always pay attention to the detail, first... OR
(b) ☐ I like to be able to see the 'big picture' first.

(a) ☐ I like to avoid problems and 'getting caught out'. .. OR
(b) ☐ I like to try new things and take risks sometimes.

(a) ☐ I prefer to fit in with everyone and be 'normal'... OR
(b) ☐ I am happy to stand alone and sometimes rebel.

(a) ☐ I am happy to work things out for myself... OR
(b) ☐ I prefer to check with the experts before going ahead.

(a) ☐ I like to get on with the job, regardless of others... OR
(b) ☐ I am happy to do my bit once I've assessed the situation.

**NEXT -** Make your way through the exhibition of paintings from **Sections 1 to 5**, answering the following questions as you go. Remember! There are no 'right' or 'wrong' answers - it's *your* opinion that counts.

**SECTION 1.**

Take a look at these two paintings A & B and try to anwer spontaneously - without thinking too hard:

| | A | B |
|---|---|---|
| Which painting do you feel most attracted to? | | |

Thinking about GLOBAL WARMING, which of the following best describes how each painting makes you feel?

| | | A | B |
|---|---|---|---|
| 1 | Hopeful, optimistic | | |
| 2 | Positive, passionate | | |
| 3 | Calm, reassured | | |
| 4 | Scared, anxious | | |
| 5 | Annoyed, frustrated | | |
| 6 | Helpless, confused | | |
| 7 | Nothing (no feelings) | | |
| 8 | Other: _____ | | |

PTO

Rhian N Field BSc(Hons)

ART-SCIENCE TORCH THEATRE EXHIBITION QUESTION SHEET May 2015

**Go to SECTION 2**

Look at these two painting A & B and try to observe your feelings, for example, ask yourself *"which one attracts my attention the most?"* . Then, answer the following questions. Go with your first intincts. Your answer is personal to *you* - there is no 'right' or 'wrong'.

| | | A | B |
|---|---|---|---|
| (a) | Which painting makes you feel like *'joining in'* the most? | | |
| (b) | Do you believe there's a LEADER in A or B? (tick either or both) | | |

( c ) Having decided if there is a leader in either of the paintings, does that ***change*** how you feel about joining in?

Tick one box

| | |
|---|---|
| **YES** Now I am happier to join in having decided there's a leader. | |
| **YES** It has put me off joining in, having decided there's a leader. | |
| **NO** I am happier to join in having decided there's a leader | |
| **NO** it has put me off joining in, having decided there's a leader | |

(d) If you decided to join the people in either of these paintings, where would you put yourself in relation to the others?

| | A | B |
|---|---|---|
| 1. Behind them (at the back) | | |
| 2. Among them | | |
| 3. In front of them (at the front) | | |

**SECTION 3.**

**Stage 1.** Take a look at Painting **A** and describe what this painting means to you - e.g. what is it about?

**Stage 2.** Now take a look at the next painting - **B** and describe what this painting is about.

**You may now lift the flap on the "Title and Descriptions" sign, fixed to the wall.**

PTO

Rhian N Field BSc(Hons)

ART-SCIENCE TORCH THEATRE EXHIBITION QUESTION SHEET May 2015

**Stage 3.** Having read the Title and Description, select one of the following for both A and B.

| | A | B |
|---|---|---|
| I preferred not knowing the title | | |
| I am confused now that I know the title | | |
| The title helps me enjoy it. | | |
| Knowing the title hasn't made any difference to me | | |

| | | |
|---|---|---|
| Reading the description helps me enjoy the work | | |
| The description has spoilt it for me | | |
| The description has confused me | | |
| The description shocks and upsets me | | |
| The description make no difference to me | | |

Other comments:

## SECTION 4.

Simply glance at these two paintings together and choose the one which you feel most comfortable with.

| | A | B |
|---|---|---|
| The painting I am most comfortable with is... | | |

Now Explain, if you can, why you chose this painting:

## SECTION 5.

This final section involves both THINKING and FEELING, which are two very different tasks.

In this section, there is a group of 4 paintings labelled "**A, B, C & D**".

1. Please describe briefly what you *THINK* each painting is about, and then how it makes you *FEEL* .
   There is no 'right' or 'wrong' answer. Your own interpretation is asked for here.

| | "This painting is about..." | "It makes me feel..." |
|---|---|---|
| **A** | | |

PTO

Rhian N Field BSc(Hons)

ART-SCIENCE TORCH THEATRE EXHIBITION QUESTION SHEET May 2015

| | | |
|---|---|---|
| **B** | | |
| **C** | | |
| **D** | | |

2. Which do you think is the LEAST desirable scenario or scene, in your opinion for you, and for the world? Tick one - A, B, C or D.

| | | A | B | C | D |
|---|---|---|---|---|---|
| (a) | ... For me and my family (Locally) | | | | |
| (b) | ... For other people around the world (Globally) | | | | |

3. How easily do you believe you would be able to adapt to climate change? Please tick one:

| | |
|---|---|
| I could adapt easily | |
| I could adapt with some help | |
| I would find it difficult to adapt | |
| I don't believe that I will need to adapt | |

FINALLY, what difference do *you think* Art can make when it comes to climate change impacts and the way that people are influenced to change their behaviour, in the environment? If you were to DRAW a picture that meant 'Climate Change' to you, what would it look like? Draw what you imagine below.

| Draw here: | Explain in words: |
|---|---|
| | |

**THANK YOU!**

PLEASE PUT YOUR QUESTION SHEET INTO THE PLASTIC TUB MARKED "COMPLETED FORMS".

Rhian N Field BSc(Hons)

## 3. Examples of Interviews and Group Discussion Responses

The two interviewees were officers of an environmental N.G.O. in Cardiff.

The following are extracts from the transcripts, in response to the research questions and interviewer's prompts:

**Interviewee A**: Environmental N.G.O. Officer.

> *"Art shows people how amazing and beautiful nature is and allows people to access it; different venues to normal can make people think differently about it;*
>
> *Something that makes you think again and makes you question it…and speaks to you…not necessarily in words or in black and white (straightforward) – is the key to getting that response.*
>
> *I think it's about seeing things through a different lens e.g. seeing from the artist's eye, things we wouldn't normally see.*
>
> *It's about giving people a window."*

In response to the suggestion that the public are becoming desensitized to climate change –

> *"I think it's the way that the government communicate, often exaggerating the case – people lose faith and mistrust (ref: cry-wolf). We need to be clever and subtle about it, reminding people about their morality and their children's futures.*
>
> *If we look out of the window, we can only see the now, but through art we can show how things will look in 100 years-time from now. I have found that volunteers respond best to honesty and facts, so they can make up their own minds. Humour can work well, but I believe that depression can stop people from acting because they tend to end up thinking "what's the point?"*

In response to whether scientists are committed to working with artists to engage the public –

> *"No – I think they see art as a very different planet, and I'm trying to bridge the gap. I think it stems back to the way children are taught art in school – if scientific illustration was part of a class in school, you would begin to see a difference. Scientists do not make the connection between their work and the potential benefits of celebrating achievements and successes within science and public engagement."*

**Interviewee B:** Environmental N.G.O. Officer. The mother of two young children describes herself as a generalist and not a specialist, with a keen interest in the natural environment.
Her comments regarding art 's role within science engagement is extracted below:

> *"It's often about the entry route…I think art has a huge role to play because most people have creativity. Science can be scary and has a right and wrong, whereas art can explain science knowledge through a creative process e.g. volcanos and earth's crust etc., it's a less intimidating entry route. Tangibility helps explain the knowledge."*

In relation to being able to influence a change in behaviour –

> *"I think that in order to act, you have to have an emotional connection and have to feel compelled to do something."*

Group interviews Transcriptions – School Pupils (in Under 18's age band)

# Group-Interview withYsgol Preseli School Council – group of 10

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 13 - 18 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | School Council |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>30mins | Welsh medium school. These pupils are voluntary members of the council. |

The group had been asked to complete a shortened (1 page) questionnaire, choose one image from a set of 10 climate change cards and now are ready to view and discuss the four paintings A, B, C & D presented by the interviewer. They have been asked to think about what each painting represents for them, or what story is might be telling and then to observe how they make them feel (what is the emotion).

**INT: Firstly…painting A**

RES: In painting A, harsher climate; erosion; more storms occurring, battering the coastline; rubbish on the beach; teddy on floor – could mean there's a baby in the house and so it could affect the family and the baby of the house; it was a home for someone – storms have had a massive effect on their life; financial impact could be huge;

**INT: Is it local, foreign…abroad?**

RES: It reminds me of that house along the English coast (Happisbrough?) – it was so close to the cliff it was falling off.

**INT: What about B?**

RES: It's an interesting one because it kind of puts it into perspective because although it looks like a stereotypical fireman it could just be a house fire, but represents our responsibility and climate change.

**INT: How about C?**

With **C,** could you say that people could be quite ignorant and say that God is looking after them and so we don't have to worry about climate change?

**INT: What about D?**

RES: It is an image that we are seeing a lot more nowadays – and how man is using the land a lot more and the affects that it is having on the wildlife.

**INT: How about these things over here on the right of the painting (points to indications of wind farm)?**

RES: Are they crosses?

You could argue that on the one hand you've got the factory spewing out pollution…then you've got the windmills trying to create renewable energy source – the two sides of the argument.

At this point the interviewer reveals the artist's ideas about the painting and the title "Natural Selection", explaining that it relates to Darwin's theories on evolution – with competing sources of energy including nature – and begs the question of "who will win?".

**INT: *Runs through the possibilities for the narrative for these four paintings hoping to detect how they might (or might not) influence people's behaviour*. But what I'd like to know now is how each one makes you *feel*…what are the emotions?**

RES**:** I think B could make you feel quite guilty because we once we've left, we've left our mistakes behind and leaving them for other people to take responsibility for them.

I think D could be our fault or people's fault because we've built the factory and polluted the area and the environment.

**INT: So, which one gives you the strongest feelings?**

RES: Maybe D, because it's like a constant battle between nature and science. As the years go by pollution and the factories overpower nature and people forget that nature was here first.

A - I find quite tragic – the fact that you think a family could have been living there. The emotion is one of sadness.

**INT: Do any of them frighten you?**

RES**:** C – because it's local.

I'd say D is quite frightening - because we have made an effort to develop energy in a sustainable way, and yet we still rely heavily on heavy industry and we're still creating pollution for things that we take for granted like fuel etc.

It puts into perspective that we're probably not doing enough to change the way that we're treating the environment around us.

A and C are most relevant to us individuals who live in Pembrokeshire e.g. Amroth, and the Cathedral.

**INT: Is there any one painting that you would relate more to the rest of the world and not just locally?**

RES: yes…"D" (consensus).

**INT: And what difference do you think looking at paintings make when talking about this (CC) subject? Does it make any difference having art as opposed to photographs or just text and some other type of medium?**

RES: I think having art like that it provokes people to talk about it and say what they feel. Text would be point blank fact, but art is open to interpretation.

**INT: So, when it comes to science what difference do you think art make to understanding it? (knowledge)**

RES: It's a bit like propaganda – e.g. B makes me feel guilty so it can back-up what scientists are saying.

I think you've got people who understand and others who need it illustrated.

**INT: Do artists do anything unique? Does it have to be a certain type of art for it to lead to a change in behaviour, and not just momentary?**

RES: You see the art and it sparks the imagination and then people can imagine what the future might be, and that realisation could change their attitude.

**INT: It has been said that art can help you to hypothesise**.

RES: On behalf of the school council may I thank you for the session – it has been interesting and an eye-opener into the effect art can have on everybody**.**

---

## Group-Interview with Ysgol Preseli Mixed Ability – group of 25

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 11-12 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | Entry (post Primary) |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>30mins | Welsh-medium school. |

**INT: There are four paintings here, what do you think they might be about?**

RES: The environment; climate change ; pollution; A is a house that's been hit by a storm; weather; global warming;

**INT: How about each one (A, B, C, D)**

RES: D is pollution; poison; burning; the weather is bad and that makes people sad.

**INT: Are any of them scary?**

RES: YES!...A, C, B (you can't get out because of the fire).

**INT: Does anyone have a favourite?**

RES: B – I like the colour; A – because it looks cool – it's an unusual with the house on its side; D – because it's like the sun setting, it's pretty; C – because of the green; C – shows how hot the sun is getting these days; I like B because it's plain…

Pupils leave the classroom and I am having a conversation with the Teacher.

**INT: We chat about the potential wisdom and good fortune of living on higher ground like the Preseli's and thetipping point for climate change.**

He is unaware that I am the artist. Teacher discusses the paintings, favouring the 'house and teddy' for his wall, and how although there is a teddy which makes it sad, it is really a serious matter, of science and climate change; we study and I explain the cathedral painting. (He is a sub aqua diver). He suggests that you could capture the subjects as shown here in the paintings through other medium such as photography, but not so dramatically.

---

N.B. For the record, this final group did not take part in the Image Poll due to lack of time. However, they completed the questionnaires provided.

# Group-Interview with Ysgol Preseli Art GCSE sample of 4 Pupils

| | |
|---|---|
| **Male/Female** | Female |
| **Age:** | 15-16 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | GCSE Art Final Yr |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>15mins | Welsh-medium school. Chosen by the teacher to participate. Timid and surprisingly slow to respond. |

**INT: Think about what the story might be in each of them – it's just your interpretation.**

RES: Is the first one (A) about sea level rising and destruction?

Looking at B – are they standing in water there?

There's the contrast between fire and water, if there is water there.

Looks a bit like ice as well.

Looks a bit like a gas tank – so it could be gas coming and global warming.

**INT: Now I'd like you to try and detect how the paintings make you feel (as opposed to what you think).**

RES: Painting D because there's mothing else there apart from a factory it feels like…it's wasting, if you get me…

**INT: Painting is turned away and then turned towards the respondent once again for her immediate (emotional) reaction.**

RES: Despair – because it's all quite dark, and so very…sad… and heavy.

**INT: How about the others then, how do they compare in terms of feelings?**

RES: A is more sad than drastic. You have to think about what it is showing you…you have to think more about it.

I don't think C gives the same impact as the others. B is similar to D – more harsh.

**INT: More drama in them, perhaps?**

**INT: So, do you relate these to your own lives and local issues, of are there any here which make you think more about the world and about everyone?**

RES: D is more to do with the world – factories are not on that scale here where we live. Here it is more green and natural.

**INT: What about climate change and what that might mean to the world?**

RES: Tragedies could be like tsunamis – like A could look like some of the houses you get in Thailand.

**INT: (in any form) is unique, isn't it? Do you feel that art can make any difference to the way that people make choices in their lives? Do you think art can do that through science?**

RES: Yeah…coz it shows how the artist is feeling at the time when they have the information from science, and then that is what the artist thinks is going to happen. It shows how people feel.

If you want everyone to understand then you need to start on a local level first.

I think they need to be harsher – maybe implying dead people – some people would just think these paintings are pretty – they might be able to relate to it more.

**INT: Do you think artists have a responsibility to use their talent for these purposes?**

RES: I don't think they've got more responsibility than everyone else.

If they can use it that's very good.

But they show the information in a different way – so I think they do have sort of an obligation because they can show it better than giving them leaflets…

They should use that skill then…to show people. (agreement expressed by the others)

**INT: What is art about? Is it about people, the human race? You're doing art…what do you see as the purpose of it?**

RES: To get a message across and then to get people to feel a certain way. People have different opinions about paintings but it's just trying to get people to feel what they feel about different paintings (art).

I think it's like - to raise awareness, to me. To show people what's happening but instead of just telling them, they can see for themselves.

We should make paintings bigger and spread them.

**INT: How do you feel about climate change, anyway?**

It's quite daunting. We can't control it really. We recycle but it's not enough. Individuals aren't going to make a difference – we all need to get into it.

I don't think we can really understand the extent of it when we haven't experienced any extreme events like other parts of the world have. We live in such a small place unlike for example Thailand.

**INT: Is there any art being done out there now which depicts those sorts of disasters?**

RES: No response…don't know.

**INT: Well there's an idea for your future research, perhaps.**

---

## Group-Interview with Ysgol Preseli GCSE Geography 26 pupils

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 15-16 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | GCSE |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>30mins | Welsh-medium school. Supervised by teacher Lowri who also participated. |

**INT: What is your interpretation of the four paintings and how do they make you feel?**

RES: B, C and D are the most dramatic.

A is evokes sadness, but is more calm, partly due to the pastel tones.

The consensus is that D is more global ; the ***crow = death***; the windmills could be reminders for us of 'green versus the non-green' in terms of the environment.

C is cooler and could be about religion suffering. B is angry and represents forest fires. There is mention of the tank shape being gas – and suggests ***we are "fuelling the fire, maybe***" if the fire is linked with climate change (metaphorically).

This tank shape was also thought to look like a ***grave***.

**INT: What if the artist worked with scientists to convey something that they agreed with…that they felt people wanted or needed to take on board?...So in other words, you haven't just got an artist doing what they want and indulging in their own artistic desires, but working with scientists on a particular objective to get a certain message or knowledge out there for people to understand and be able to take on board.**

RES: I think if they want people to start saving energy and do something about climate change, they are going to make it look worse than it actually is, potentially.

Yeah, but I think you need that to kind of shock them otherwise they won't do it. If you have an everyday statistic, then it doesn't really make an impact on you.

That's the worse-case scenario then…because you need to show it.

Well it could work the opposite way, so that people do *no*t do anything about it.

It depends how you interpret it – if you look at an image and think "oh I can deal with that later, that's fine" then nothing's going to happen. They might have to exaggerate it to make something actually happen or if they don't exaggerate it enough…you have to get the ***balance*** right.

**INT: -"balance right"? ...that's interesting! (Talks about personality and motivation traits and people can respond in opposite ways to the same stimulus – and this might be where balance also comes in).**

# Interview with Ysgol Bro Hyddgen – Group of 11, aged 13

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 15 |
| **Location of interview:** | Machynlleth Dyfi Biosphere |
| **Status / Title** | Triple Science n=11 |
| **Environment type:** | Class room– grouped table arrangement. |
| **Organisation:** | Ysgol Bro Hyddgen |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 16th July 2015 |
| **Recorded Y/N** | YES audio |
| **Notes:** | Welsh medium school. |

The group had been asked to complete a shortened (1 page) questionnaire, choose one image from a set of 10 climate change cards and now are ready to view and discuss the four paintings A,B,C & D presented by the interviewer. They have been asked to think about what each painting represents for them, or what story is might be telling and then to observe how they make them feel (what is the emotion).

**INT: firstly, we have painting A**

**RES:** Painting A – high tide, house falling off the dunes, sea's been rising and taking houses out, teddy bear suggests a child was living there and now it's homeless; the bird could be losing its home, pylons falling down, house in distance has sunk, stormy skies.

**INT: How about painting B?**

**RES:** It's got so hot that things are burning, climate change has increased the sun's heat, grass fires**,**

INT: do you get any grass fires around here? We do in Pembrokeshire.

**RES:** Some…not many.

Firemen look like they're standing in water, but it doesn't look natural; tanks look like gas tanks so it could be a gas factory on fire; it looks like a gravestone so it could be a church that's on fire;

**INT: So, what might have caused the fire?**

**RES:** When boats go over water they lose oil and then it could cause a fire on the water.

Looks like there's land there. Could be a grass fire because the flames are really high and there's smoke.

**INT: Do you think it's hot? Would there be any sounds?**

Moving on to next painting – C…

RES: It looks like that place is very dry because plants look like they're wilting; I think the sea has come up so high that it's flooded the church; It looks stormy because the plants look as though they're being blown; it's dark and gloomy; it could be a portal into another world; an apocalypse…because it looks like something's happened and everybody has turned into something else and people have turned to god; the plants don't look familiar, climate change might have led to plants changing and being different to what they are now;

**INT: What's D about then?**

**RES:** It's a factory; it shows the main problems of climate change – gas in the air; on the right it looks like a wave it coming over factory; it looks bare and deserted – old wire fence…

Going back to C – is it that the sky is full of smoke which is obscuring the sun and that's why the plants are dying?

(D) Is it there are two types of energy…the factory and the windfarms on the hill.

**INT: Which stands out the most?**

**RES: …**the factory does.

**INT: Is there anything else in this picture that no-one has mentioned yet?**

**RES:** …the crow! Looks like there were also sheep trying to get out of the field – see the bits of sheep wool on the barbed wire fence. Crows are dark and evil and give you the feeling of bad. The factory looks like ship on the horizon – could be high sea levels.

**INT: Going back to painting A – let's talk about your feelings. Is it funny, do you feel happy, annoyed…?**

**RES:** Out of control?? Nervous and scared; sad, angry you can't do anything to stop it;

**INT: How about B? Any feelings?**

**RES:** Scared, un-tameable (?), anxious, helpless,

**INT: And C?**

**RES:** Confused, clueless, curious, anxious (spooky),

**INT: And the last one – D…**

**RES:** Threatened, confused, annoyed,

# Interview with Ysgol Bro Hyddgen – Group of 11, aged 11/12

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 11/12 |
| **Location of interview:** | Machynlleth Dyfi Biosphere |
| **Status / Title** | Year 8 n=11 |
| **Environment type:** | Class room– grouped table arrangement. |
| **Organisation:** | Ysgol Bro Hyddgen |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 16th July 2015 |
| **Recorded Y/N** | YES audio |
| **Notes:** | Welsh medium school. |

**INT: OK…so what are these about?**

RES: A falling house; a kid died…there's a teddy so maybe the kid got out and dropped the teddy; is it the water's come along and washed the ground away? A tsunami. Water left ground all soggy and it collapsed like a mudslide.

I feel sad; I like the colours of the picture; makes me feel lucky about where I live - grateful; feels like there's tension; flooded…from global warming and ice melt, sea level rise; it looks weird coz there's no-one in the house – it's confusing; abandoned; disappointed that that happened;

**INT: We're moving on now to B…**

RES: Intrigued; happy because it's hot; scared; worried for the firemen; there's water there – firemen are standing in it; or it's an oil spill; I feel grateful to the firemen; maybe the firemen are sad and one of their friends are in there (the fire);

**INT: It's great that you're describing how THEY might be feeling, in the painting, but how do YOU feel?**

RES: I feel sad because people have to deal with it, so I also feel grateful;

**INT: Any sounds or smells with that painting?**

RES: Crackling;

**(they discuss between them how the firemen are dealing with an oil spill fire…)**

**INT: Onto painting C now…I'll give you a clue – that's a cathedral…**

RES: How did the cathedral get down there in the first place? There's a legend…you can still hear the bells; what about the lost city of Atlantis?; interesting – because it's not straight and because there are lights on – makes you suspicious and curious; it could be a portal into another time where people haven't evolved as much as us – (futuristic?) because humans evolved from fish; haunted house;

I feel spooked; depressed;

**INT: Ok…final one – D. so how does this one make you feel?**

RES: Pollution from chimneys make me sad, but windfarms make me happy – because there's balance; I feel sad because the scenery is being ruined; heaven and hell – the left hand side is hell because it's dark and fire – on the left hand side it's heaven but it's more hell than heaven; disgusted – they try to make a living but they won't be able to much longer because of the pollution of the air; at the bottom of the hill is the factory but as they go up the hill towards the windfarm they are evolving; shocked, disgusted,

**INT: Is there anything in that picture that no-one's mentioned yet?**

RES: It looks like people have been evacuated – it looks empty; war – pollution is attacking the windmills (they are obscured by the smoke) and so the windmills are attacking the pollution – (a battle between them); there's a bird…there's a bird in each one…is it a crow?

**INT: So, if that bird wasn't in that picture, if you took it out, would it make any difference?**

RES: I think it does…if it wasn't there it could mean that the air is toxic; it makes it more dramatic;

**INT: did the bird have anything to do with you saying that the left-hand side of the painting was evil?**

**RES: (Zack) "***I have a massive theory!"... "this house has a bird – that is a bird (points) – that house is on the edge of water – there's a fire on the edge of water – then this is built out of stone…under water – all relation to water – then, no water but smoke and fire, again – all relation – theory!"* **(an attempt to link all four paintings).**

The bird is about life and death. There's no human life in these paintings apart from the firemen who are fighting life and death. Climate change is therefore about life and death. If we are the future, then we need to stop climate change and save lives.

# Interview with Ysgol Bro Hyddgen – Geography Group of 16, aged 13

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 13 |
| **Location of interview:** | Machynlleth Dyfi Biosphere |
| **Status / Title** | N=16 |
| **Environment type:** | Class room– grouped table arrangement. |
| **Organisation:** | Ysgol Bro Hyddgen |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 16th July 2015 |
| **Recorded Y/N** | YES audio |
| **Notes:** | Welsh medium school. |

**INT: There's no right or wrong – you just tell me what you think and how you feel. So – painting A**…

RES: It's aa house on the beach; coastal erosion; there's a child in the story because of the teddy; rising sea levels; they tried to run away; it could be saying that global warming is destroying children's childhoods; the child has been lost to the sea and the house is going to follow; wildlife (bird) shows that it affects everyone; I don't like having the bird in the picture because it draws your eye away from the other things; I do like the bird because it's a reminder that is has a wide affect;

I feel sadness because of the child and the teddy; shame because we have caused it; pity; concern for the family that actually lived there – what if they had no insurance?

**INT: Let's go on to the next one, B.**

RES: Maybe the colours have an effect on your emotions – in theory and in practice; it's quite softly painted and not too much detail; it's intriguing; lightning strike; storm; bomb – people desperate for food, trying to keep law and order; it almost looks like it's on a beach; it could be anywhere, local or otherwise; bravery; fear;

**INT: Are you talking about their bravery?**

RES: yes. There's a sense of beauty because of the fire. It's ironic that fire – what we live by, can also kill us.

**INT: Moving on to C,**

RES: It's more detailed; worried about the future generation, (it could be us), colours make it look more fantasy; I don't think its fantasy – it could be real; it could mean that there's a glimmer of hope because the lights are still on in the cathedral; it's symbolic of life; colours are bright and happy but I get a sadder feeling;

**INT: Onto the final painting D – what does that do for you?**

RES: That's really realistic; very good details; it's sad because that has actually happened; diabolical; it looks evil – because of the black and purple; the crow looks tatty; pollution is coming out – everything is a harsh, harsh message; there's a big rabbit head and horse in the smoke in the sky; the blue in the sky behind the smoke is there to remind us of the contrast – false sense of security; there are windfarms – perhaps it says there isn't any hope even though there are windfarms; it's saying that we've discarded that method already (windfarms); there's still white wool on the fence so it shows that it was farmland and they had to move out; it sends a strong message – (only three of them said they would want to hang this painting on their wall). Painting A has calm colours which would be easier on the eye but has a dark message;

A and D makes them feel sad.

D makes us sad and guilty.

We've been too short sighted.

INT: We've been looking at art with an underlying subject of climate change but what difference do you think that makes – is there a role for art in working with science to get humankind to make shifts in certain behaviours?

Yes, in advertising – to get the message across. These make you feel guilty which can make a difference (although not all agreed). If you use both art and facts and figures – they're both equally as powerful – that's what makes good art – that which relates to everyone; If it's not completely clear I'm not going to stand there and try and work it out; I disagree, I think that's what makes the difference, having to try and work it out;

In response to support for statistical information, at least with a picture you have your own interpretation as opposed to a statistic. That's what helps you to remember it, too.

## 4. Examples of Questionnaire Quantitative Results

(n=55)

| | | | | | |
|---|---|---|---|---|---|
| FEMALE | 31 | | | | |
| MALE | 24 | | | | |
| **Occupation:** | Students | 16 | | Science-based | 20 |
| | Private Sector | 13 | | Arts-based | 14 |
| | Retired (non-defined) | 6 | | | |
| | Academic e.g. teacher | 6 | | | |
| | NGO | 6 | | | |
| | Public Sector | 5 | | | |
| | Administrative | 2 | | | |
| | Unemployed | 1 | | | |
| **First language:** | English | 50 | **Second language**: | Welsh | 10 |
| | Welsh | 4 | | English | 1 |
| | Other | 1 | | French 2, German | 1 |

| | | |
|---|---|---|
| **Nationality:** | Welsh | 20 |
| | British | 19 |
| | English | 3 |
| | Hungarian | 1 |

**Age range**:

| | | | | | |
|---|---|---|---|---|---|
| 11-16 | 9 | (16%) | 41-60 | 14 | (25%) |
| 17-21 | 3 | (5%) | 60-79 | 9 | (16%) |

| | | | | | |
|---|---|---|---|---|---|
| 22-30 | 13 | (24%) | 80+ | 2 | (4%) |
| 31-40 | 5 | (9%) | | | |

**How important do you feel science is in your life?**

| | |
|---|---|
| Not important | 0 |
| Of some importance | 7 |
| Quite important | 6 |
| Very important | 18 |
| Not sure | 0 |

**How important is ART in your life?**

Average rating given 7.125 (ranging from 0 – 10, but most commonly 7 and above)

**Art events:**

| | | | |
|---|---|---|---|
| Attended | 19 | Science 'helps' understanding of life? | YES - 30 |
| Organised | 10 | Art 'helps' understanding of science? | YES - 11 NO - 15 |
| Participated | 11 | | |

**In-touch with natural environment?**

Most selected statement:

I am in-touch with my natural environment in some ways.

I would like to be more in-touch with my natural environment.

**Have you been the victim of a natural disaster?** YES – 3 (flood x 1).

**How environmentally-friendly are you compared with other people?**

| | |
|---|---|
| The same as… | 13 |
| Better than them… | 12 |
| Not so good as others… | 3 |

**Who or what is to blame for Climate Change?**

| | |
|---|---|
| Humans (11) | Landfill (1) |
| Everyone (2) | Littering (1) |
| Capitalists (1) | No-one / nothing (1) |
| Mankind – profit (1) | Natural cycle (1) |
| Industry (2) | Policy makers (1) |
| Money (2) | Everything (1) |
| People and government (1) | |

| | | |
|---|---|---|
| Does Climate Change affect you now? | YES – 20 | NO - 10 |
| Will climate Change affect you in the future? | YES – 27 | NO - 3 |
| Does Climate Change worry you? | YES – 22 | NO - 7 |

**How would you describe where you live?**

Urban - 11 Sub-urban – 2 Semi-rural – 23 Rural – 4

**Who in your household has the most influence on the following decisions?**

| | Food shop | T.V. watched | Transport | Recycling & energy | Community involvement | TOTAL |
|---|---|---|---|---|---|---|
| **I do** | 11/9 | 8/5 | 10/5 | 12/6 | 7/4 | 48/29* |
| **Wife** | 5 | 3 | - | - | - | 8* |
| **Husband** | - | 2 | 1 | - | 1 | 3 |
| **Joint** | 4 | 6 | 7 | 7 | 6 | 30 |
| **Mum&Dad** | 2 | - | 4 | 3 | 1 | 10/5 |
| **Mum** | 7 | 2 | 6 | 3 | 2 | 20* |
| **Family** | - | 5 | 1 | 4 | 5 | 15 |

*Female

[N.B. Solely female 29+8+5+20=62] Total 134

**Motivation traits**

(i) (a) Away from 9 (b) Toward 21

(ii) (a) Away/external/proactive 12 (b) Toward/internal/reactive 19

(iii) (a) Internal 25 (b) External 3

(iv) (a) Proactive 24 (b) Reactive 4

**If you had £5,000 to invest, how would you divide it between science and art projects?**

SCIENCE 62%

ART 38%

## 5. Examples of Questionnaire Qualitative Results

**How can Art help Science to communicate to the ordinary person on the street?**

**Here are the most interesting responses:**

*"By helping children and people to express themselves in the arts"*

*"By bringing images of climate change to the attention of the ordinary person"*

*"Make it eye-catching, grab attention; by by-passing the formal"*

*"Through education"*

*"Relate to different people in different ways"*

*"You can't"*

*"Broaden message to those who have barriers to science"*

*"Art is seen as fun, science as serious – each can help the other"*

*"Affect emotions which can then be intellectualised"*

*"Visual confirmation of events around the world"*

*"It can't – why would they take an interest in science just because of art?"*

*"To use colours and make the bad things see-able"*

*"By breaking down difficult theories/hypothesise into artistic messages"*

*"A picture holds a thousand words – in every language, and stays in the mind as an idea, a dream. Show change due to man, beauty in nature, man as nature – not above, or separated from nature"*

*"Complex technical issues can often be explained simply through other media – art, drama, brings science to life"*

*"Demonstrate the beauty of science and show us things we might not necessarily see / appreciate in day to day life"*

*"By introducing subtle messages and obvious ones. Banksy's work seems to be admired by many – it has messages but perhaps too subtle for many"*

*"By concentrating on political subjects to disturb public opinion"*

*"Many people can relate to art more effectively than to science. Many people do not understand or are interested in science so using art could help people understand science"*

*"Capture people's interest with easy to follow programmes on TV in schools"*

*"Visualising changes"*

*"Through imagery. Simple communication for the masses (who are simple!)"*

*"Images and advertising"*

*"It can normalise the messages around climate change and the negative impacts it will have. It can make someone think differently. One of the best thinks I have seen was an image of a child lifting up a wave in the ocean like lifting up a carpet and underneath was an enormous amount of rubbish."* (below)


http://www.greenerideal.com/lifestyle/0917-incredible-photos-illustrate-the-importance-of-climate-change/"

*"It can help explain it better in an easy and comprehensive way."*

*"It can present science in a way that people can relate to - or which better taps into emotions and our imaginations than scientific publications can."*

*"By conveying knowledge through visual or literary dialogue that they understand, knowledge becomes flexible with the artistic input."*

*"Interactive, open events / activities 'doing' things much more effective than being told."*

*"The ordinary person on the street I don't think you can communicate anything science related by art to be honest. Science is not a game, the point is that it has strict rules and it is not about emotions art operates with."*

*"Communicate through images and involvement in events / projects / community action."*

*"Providing thinking / talking points, grabbing attention, making it more accessible / interpretation of science in a new way."*

*"Helps them see the big picture - think strategically. Easier to comprehend issues quickly - shows results in future."*

## 6. Field Experiment: Examples of Qualitative Results

SECTION 3

Stage 1 & 2

**Describe what painting A represents/means to you.**

*No voice; an individual perspective waiting for the fulfilment; questions; big headed alien; no idea; no clue; someone stuck in the picture, an ice cube with a sad face that is melting; a face, quite clownish but also out of this world; nothing – a vague sense of face – eyes and mouth; a clown's face, nothing; confusing but nice colours; big brother; doughnuts / ground zero; confusion, clown-like, ice cube; target at top of the mountain; a mouth; technology is drowning; someone speaking; something spoken; a question upsetting peace.*

**Describe what painting B represents/means to you.**

*You and we have no future; isolation, desperation, man-made effect; hope!; Frightened bear stranded; "Oops!"; Global warning/Green Peace advert; disappearing ice cap, desperate polar bear; global warming and polar bear stuck on an iceberg; ice age; a polar bear with no hope of survival; being alone and clinging to the last vestiges of normality; global warming / climate change is real and happening now; despair, global warming, shrinking ice-cap; the last polar bear on the last piece of ice, due to global warming; fear – same colour (as A) but my heart is facing faster – blood; easy sentimentality; global warming; a scene from another planet; typical (cliché) view of climate change; Climate change, melting polar ice caps. Beaming sun - continual waves of heat. Red polar bear - Danger, fear, crisis. Position of polar bear - on ice ledge - secluded, trapped, alone - no way for rescue/to be saved - upsetting + the position of his body; lonely, sadness, hanging on; bleak future; bear is sad, trapped, nature surrounded by danger; climate change; urgent action needed; Foxes Glacier Mints" –sorry! But it became sadder when I looked more closely - I didn't notice the RED for a while; it reminds me of a cartoon due to the colours, but makes me worry about the bear.*

SECTION 4

**Why have you chosen A/B?**

Not many participants gave a reason for their choice however those that did gave similar responses including the following:

*Composition; more integrated and centred (A); closer together (A); sun seems closer in (A); closer together (A); it appears to be calmer (B); the sun above the 'o' gives a better sense of balance (B); it's stiller, more serene (A); more movement (A); prefer the composition (A); there*

*was a sense of togetherness – made me feel safer (A); the same distance from the sea (B); more coherent togetherness and objects are the main focus unlike B (A); A looks a bit threatening somehow (B); I like the space – do not feel comfortable too close ((B).*

**Group Interview–Secondary School aged 13-18yrs & Mixed ability 11–12yrs**

Four paintings were displayed within the classroom for discussion:

A B C D




Group-Interview withYsgol Preseli School Council – group of 10

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 13 - 18 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | School Council |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>30mins | Welsh medium school. These pupils are voluntary members of the council. |

The group had been asked to complete a shortened (1 page) questionnaire, choose one image from a set of 10 climate change cards and now are ready to view and discuss the four paintings A, B, C & D presented by the interviewer. They have been asked to think about what each painting represents for them, or what story is might be telling and then to observe how they make them feel (what is the emotion).

RES: In painting A harsher climate; erosion; more storms occurring, battering the coastline; rubbish on the beach; teddy on floor – could mean there's a baby in the house and so it could affect the family and the baby of the house; it was a home for someone – storms have had a massive effect on their life; financial impact could be huge;

**INT: Is it local, foreign…abroad?**

RES: It reminds me of that house along the English coast (Happisbrough?) – it was so close to the cliff it was falling off.

**INT: What about B?**

RES: It's an interesting one because it kind of puts it into perspective because although it looks like a stereotypical fireman it could just be a house fire, but represents our responsibility and climate change.

With C, could you say that people could be quite ignorant and say that God is looking after them and so we don't have to worry about climate change?

**INT: What about D?**

RES: It is an image that we are seeing a lot more nowadays – and how man is using the land a lot more and the affects that it is having on the wildlife.

**INT: How about these things over here on the right of the painting (points to indications of wind farm)?**

RES: Are they crosses?

You could argue that on the one hand you've got the factory spewing out pollution…then you've got the windmills trying to create renewable energy source – the two sides of the argument.

At this point the interviewer reveals the artist's ideas about the painting and the title "Natural Selection", explaining that it relates to Darwin's theories on evolution – with competing sources of energy including nature – and begs the question of "who will win?".

**INT: *Runs through the possibilities for the narrative for these four paintings hoping to detect how they might (or might not) influence people's behaviour*. But what I'd like to know now is how each one makes you *feel*…what are the emotions?**

RES**:** I think B could make you feel quite guilty because we once we've left, we've left our mistakes behind and leaving them for other people to take responsibility for them.

I think D could be our fault or people's fault because we've built the factory and polluted the area and the environment.

**INT: So, which one gives you the strongest feelings?**

RES: Maybe D, because it's like a constant battle between nature and science. As the years go by pollution and the factories overpower nature and people forget that nature was here first.

A I find quite tragic – the fact that you think a family could have been living there. The emotion is 'sad'.

**INT: Do any of them frighten you?**

RES**:** C – because it's local.

I'd say D is quite frightening - because we have made an effort to develop energy in a sustainable way, and yet we still rely heavily on heavy industry and we're still creating pollution for things that we take for granted like fuel etc.

It puts into perspective that we're probably not doing enough to change the way that we're treating the environment around us.

A and C are most relevant to us individuals who live in Pembrokeshire e.g. Amroth, and the Cathedral.

**INT: Is there any one painting that you would relate more to the rest of the world and not just locally?**

RES: yes…"D" (consensus).

**INT: And what difference do you think looking at paintings make when talking about this (CC) subject? Does it make any difference having art as opposed to photographs or just text and some other type of medium?**

RES: I think having art like that it provokes people to talk about it and say what they feel. Text would be point blank fact, but art is open to interpretation.

**INT: So, when it comes to science what difference do you think art make to understanding it? (knowledge)**

RES: It's a bit like propaganda – e.g. B makes me feel guilty so it can back-up what scientists are saying.

I think you've got people who understand and others who need it illustrated.

**INT: Do artists do anything unique? Does it have to be a certain type of art for it to lead to a change in behaviour, and not just momentary?**

RES: You see the art and it sparks the imagination and then people can imagine what the future might be, and that realisation could change their attitude.

**INT: It has been said that art can help you to hypothesise**.

RES: On behalf of the school council may I thank you for the session – it has been interesting and an eye-opener into the effect art can have on everybody**.**

---

## Group-Interview with Ysgol Preseli Mixed Ability – group of 25

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 11-12 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | Entry (post Primary) |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>30mins | Welsh-medium school. |

**INT: There are four paintings here, what do you think they might be about?**

RES: The environment; climate change; pollution; A is a house that's been hit by a storm; weather; global warming;

**INT: How about each one (A, B, C, D)**

RES: D is pollution; poison; burning; the weather is bad and that makes people sad.

**INT: Are any of them scary?**

RES: YES!...A, C, B (you can't get out because of the fire).

**INT: Does anyone have a favourite?**

RES: B – I like the colour; A – because it looks cool – it's an unusual with the house on its side; D – because it's like the sun setting, it's pretty; C – because of the green; C – shows how hot the sun is getting these days; I like B because it's plain…

Pupils leave the classroom and I am having a conversation with the Teacher.

**INT: We chat about the potential wisdom and good fortune of living on higher ground like the Preselis and the tipping point for climate change.**

He is unaware that I am the artist. Teacher discusses the paintings, favouring the house and teddy for his wall, and how although there is a teddy which makes it sad, it is really a serious matter, of science and climate change; we study and I explain the cathedral painting. (He is a sub aqua diver). He suggests that you could capture the subjects as shown here in the paintings through other medium such as photography, but not so dramatically.

N.B. For the record, this group did not take part in the Image Poll, due to lack of time. However, they completed the questionnaires provided.

---

## Group-Interview with Ysgol Preseli Art GCSE sample of 4 Pupils

| | |
|---|---|
| **Male/Female** | Female |
| **Age:** | 15-16 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | GCSE Art Final Yr. |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>15mins | Welsh-medium school. Chosen by the teacher to participate. |

| | |
|---|---|
| | Timid and surprisingly slow to respond. |

**INT: Think about what the story might be in each of them – it's just your interpretation.**

RES: Is the first one (A) about sea level rising and destruction?

Looking at B – are they standing in water there?

There's the contrast between fire and water, if there is water there.

Looks a bit like ice as well.

Looks a bit like a gas tank – so it could be gas coming and global warming.

**INT: Now I'd like you to try and detect how the paintings make you feel (as opposed to what you think).**

RES: Painting D because there's mothing else there apart from a factory it feels like…it's wasting, if you get me…

**INT: Painting is turned away and then turned towards the respondent once again for her immediate (emotional) reaction.**

RES: Despair – because it's all quite dark, and so very…sad… and heavy.

**INT: How about the others then, how do they compare in terms of feelings?**

RES: A is more sad rather than drastic. You have to think about what it is showing you…you have to think more about it.

I don't think C gives the same impact as the others. B is similar to D – more harsh.

**INT: More drama in them, perhaps?**

**INT: So, do you relate these to your own lives and local issues, of are there any here which make you think more about the world and about everyone?**

RES: D is more to do with the world – factories are not on that scale here where we live. Here it is more green and natural.

**INT: What about climate change and what that might mean to the world?**

RES: Tragedies could be like tsunamis – like A could look like some of the houses you get in Thailand.

**INT: (in any form) is unique, isn't it? Do you feel that art can make any difference to the way that people make choices in their lives? Do you think art can do that through science?**

RES: Yeah…coz it shows how the artist is feeling at the time when they have the information from science, and then that is what the artist thinks is going to happen. It shows how people feel.

If you want everyone to understand then you need to start on a local level first.

I think they need to be harsher – maybe implying dead people – some people would just think these paintings are pretty – they might be able to relate to it more.

**INT: Do you think artists have a responsibility to use their talent for these purposes?**

RES: I don't think they've got more responsibility than everyone else.

If they can use it that's very good.

But they show the information in a different way – so I think they do have sort of an obligation because they can show it better than giving them leaflets…

They should use that skill then…to show people. (agreement expressed by the others)

**INT: What is art about? Is it about people, the human race? You're doing art…what do you see as the purpose of it?**

RES: To get a message across and then to get people to feel a certain way. People have different opinions about paintings but it's just trying to get people to feel what they feel about different paintings (art).

I think it's like - to raise awareness, to me. To show people what's happening but instead of just telling them, they can see for themselves.

We should make paintings bigger and spread them.

**INT: How do you feel about climate change, anyway?**

It's quite daunting. We can't control it really. We recycle but it's not enough. Individuals aren't going to make a difference – we all need to get into it.

I don't think we can really understand the extent of it when we haven't experienced any extreme events like other parts of the world have. We live in such a small place unlike for example Thailand.

**INT: Is there any art being done out there now which depicts those sorts of disasters?**

RES: No response…don't know.

**INT: Well… there's an idea for your future research, perhaps.**

## Group-Interview with Ysgol Preseli GCSE Geography 26 pupils

| | |
|---|---|
| **Male/Female** | Mixed |
| **Age:** | 15-16 |
| **Location of interview:** | Crymych, Pembs |
| **Status / Title** | GCSE |
| **Environment type:** | Class/conference style room – C-shape table arrangement. |
| **Organisation:** | Ysgol Preseli |
| **Sector:** | Under 18 Education |
| **Date & Time:** | 27th Jan 2015/a.m. |
| **Recorded Y/N** | YES audio |
| **Notes:**<br><br>30mins | Welsh-medium school. Supervised by teacher Lowri who also participated. |

**INT: What is your interpretation of the four paintings and how do they make you feel?**

RES: B, C and D are the most dramatic.

A is evokes sadness, but is more calm, partly due to the pastel tones.

The consensus is that D is more global; the ***crow = death***; the windmills could be reminders for us of green versus the non-green in terms of the environment.

C is cooler and could be about religion suffering. B is angry and represents forest fires. There is mention of the tank shape being gas – and suggests ***we are "fuelling the fire, maybe***" if the fire is linked with climate change (metaphorically).

This tank shape was also thought to look like a ***grave***.

**INT: What if the artist worked with scientists to convey something that they agreed with…that they felt people wanted or needed to take on board? So, in other words, you haven't just got an artistdoing what they want' and indulging in their own artistic desires, but working with scientists on an objective aimed at getting a certain message or knowledge out there for people to understand and take on board.**

RES: I think if they want people to start saving energy and do something about climate change, they are going to make it look worse than it actually is, potentially.

Yeah, but I think you need that to kind of shock them otherwise they won't do it. If you have an everyday statistic, then it doesn't really make an impact on you.

That's the worse-case scenario then…because you need to show it.

Well it could work the opposite way, so that people do *no*t do anything about it.

It depends how you interpret it – if you look at an image and think "oh I can deal with that later, that's fine" then nothing's going to happen. They might have to exaggerate it to make something actually happen or if they don't exaggerate it enough…you have to get the ***balance*** right.

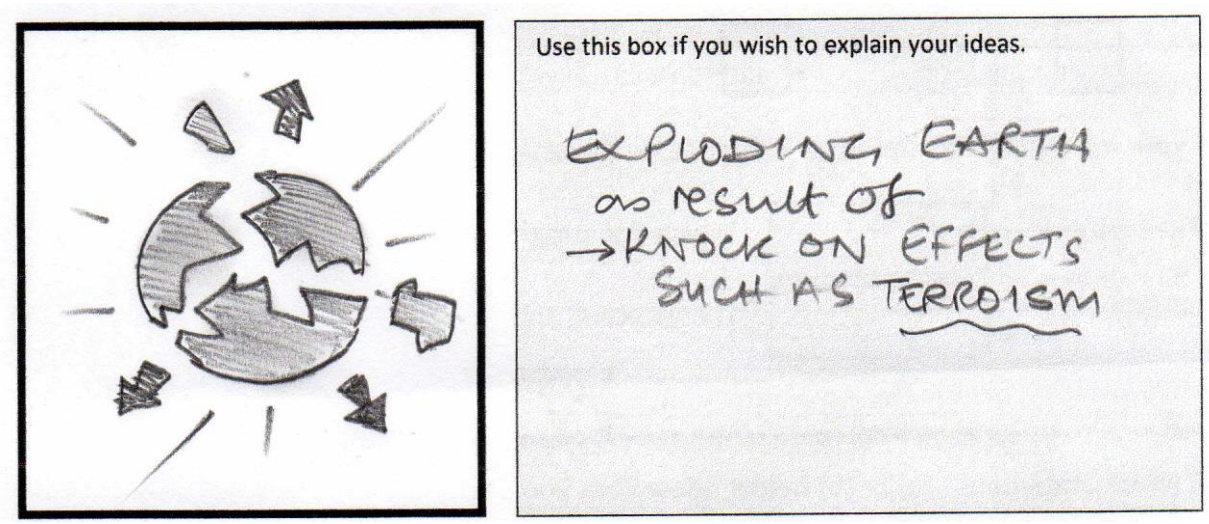
**INT: -"balance right"? ...that's interesting! (Talks about personality and motivation traits and people can respond in opposite ways to the same stimulus – and this might be wherebalance also comes in).**

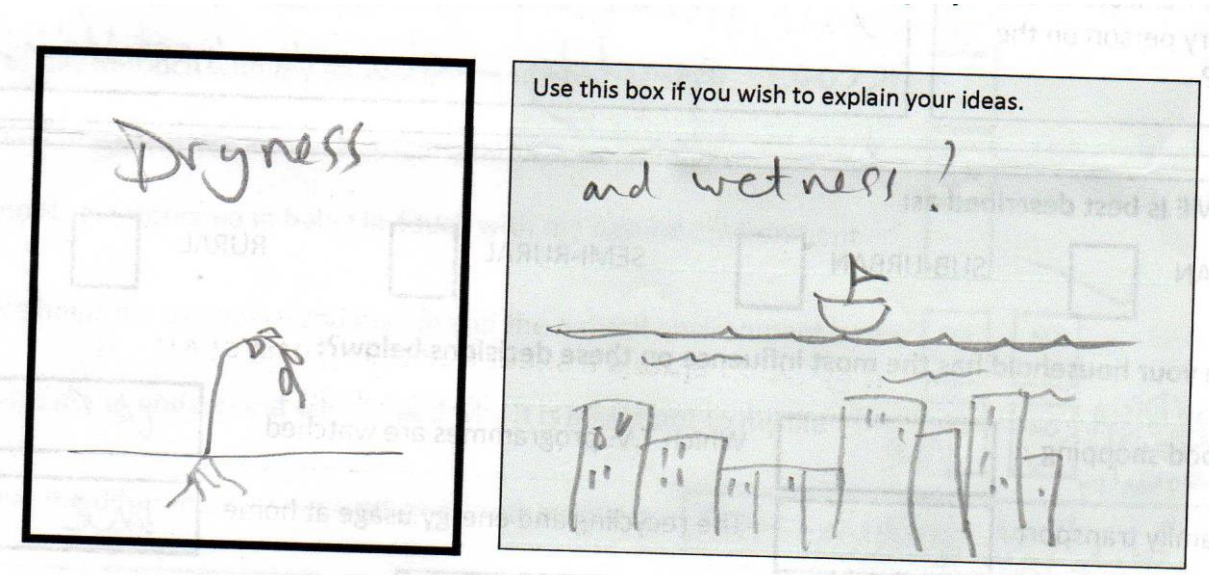
## 7. Climate Change Drawings by the adult public.

Extracted from Questionnaires.

This is a unique collection of ideas and drawings by the public which aim to convey climate change impacts, collated from questionnaires and interviews during 2014 and 2015, in Cardiff, the Dyfi Biosphere and Pembrokeshire, Wales, UK.

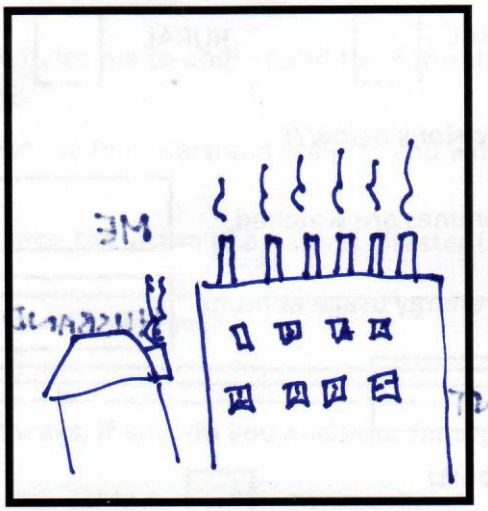
Participants were asked to draw or explain what they visualise when thinking about the impacts of climate change. The question posed was "what represents climate change - *for you*?"



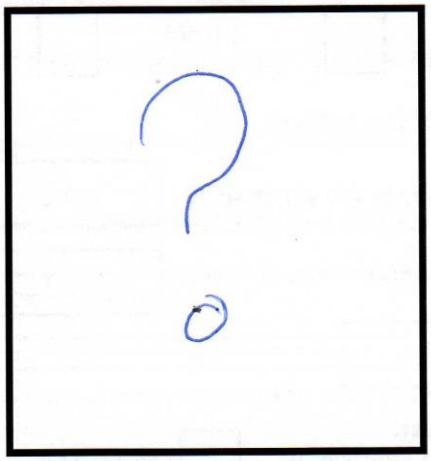

Use this box if you wish to explain your ideas.

RAIN + FLOOD –
THE UMBRELLA = PROTECTION
BUT THERE'S NO STOPPING
THE FIRE.
LET'S LOOK AFTER OUR WORLD
TO BE SURE.



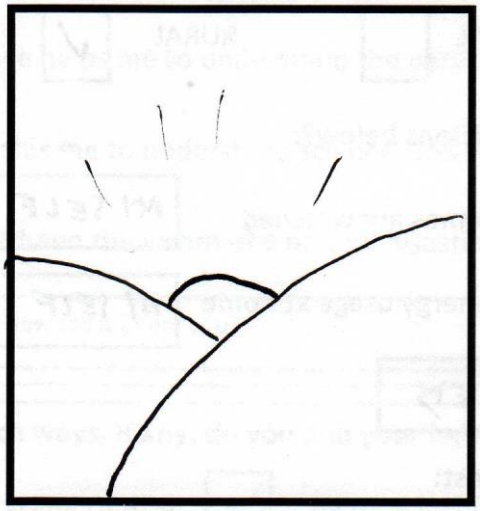
Use this box if you wish to explain your ideas.

THE USE OF ENERGY, FUELS OVER
THE YEARS.



Use this box if you wish to explain your ideas.

Not sure how significant current
change is compared to e.g. ice ages



Use this box if you wish to explain your ideas.

Sun coming up (or going down).


Use this box if you wish to explain your ideas.

Epic storms, failed crops, drought, flooding / sea level rise, climate change - refugees in 'the South' = West closes it's borders. Despair!

Use this box if you wish to explain your ideas.

climate change can effect animals which could not survive out of their natural habitat. Polar bears in the atlantic, they might be gone in the next 100 years.

Use this box if you wish to explain your ideas.

INEQUALITY INCREASED

- SOME PEOPLE DON'T HAVE CAPACITY OR RESOURCES TO MAKE NECESSARY CHANGES AND SO HAVE TO SUFFER WHATEVER IS THROWN AT THEM.

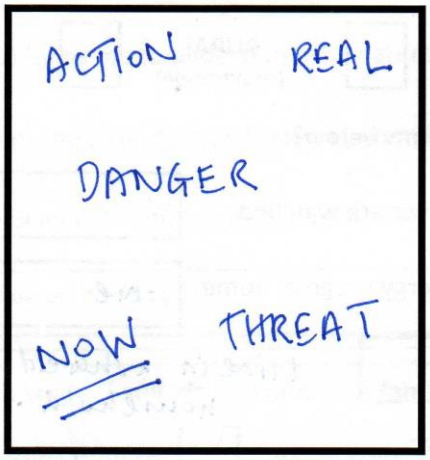
Use this box if you wish to explain your ideas.

HOUSES UNDERWATER

Use this box if you wish to explain your ideas.

A crowded world with people facing severe storms etc.

ARTIST VISUALISATION.




Use this box if you wish to explain your ideas.


Use this box if you wish to explain your ideas.

Polar bears on lonley small ice bergs. The rest have all melted.

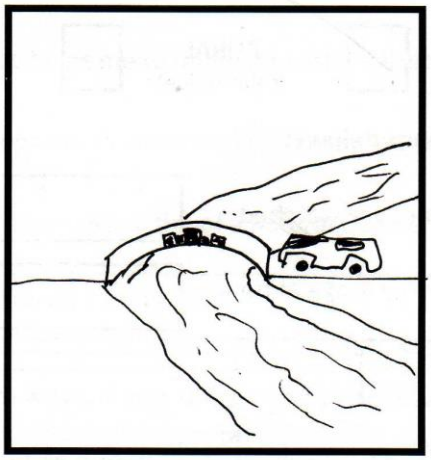
Use this box if you wish to explain your ideas.

The drowning world in the heat of an ever increasing sun. Both the sea + the sun double as metaphorical for our ~~collos~~ needing reliance on fossil fuels + resources + ~~our~~ the inevitable march of climate change.

Use this box if you wish to explain your ideas.

Use this box if you wish to explain your ideas.

The earth is on its side to indicate it has turned ~~upside~~ off its axis. The yellow tears and eyes illustrate radioactive materials, with the atmosphere illustrating fire.

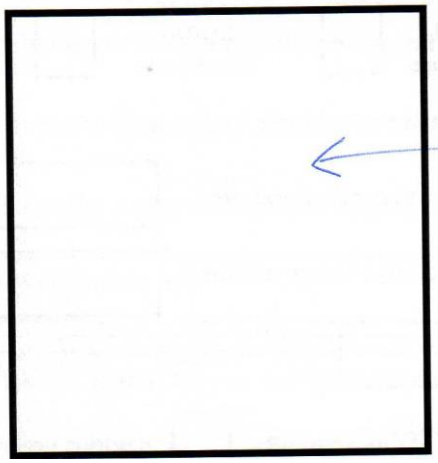


Use this box if you wish to explain your ideas.

It's an old stone bridge (you see plenty in West Wales), they've been there for hundreds of years - but cannot deal with the changes in our rivers.

Use this box if you wish to explain your ideas.

The only thing remaining at the end of the day is our planet and the rules of nature. Sooner or later humans and all existing species will be gone but the rules of nature will not change. The question is when this happens.



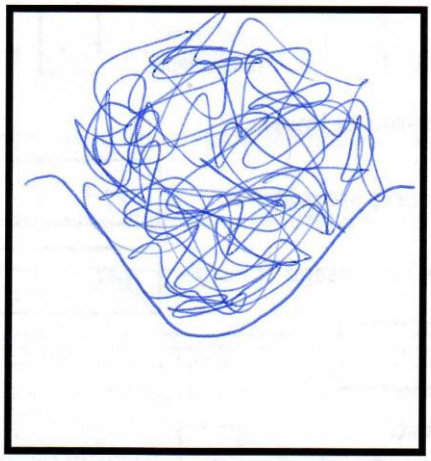
Use this box if you wish to explain your ideas.

← tears depression unhappiness Poverty starvation

POVERTY
STARVATION

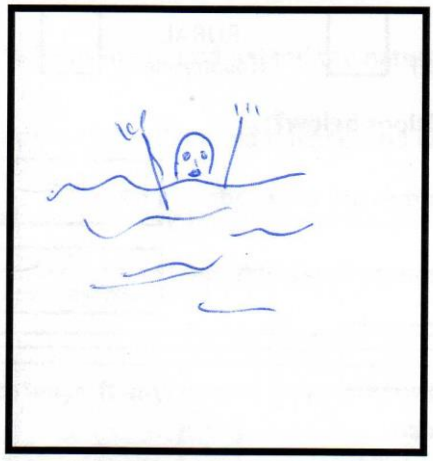
Use this box if you wish to explain your ideas.

Flooding

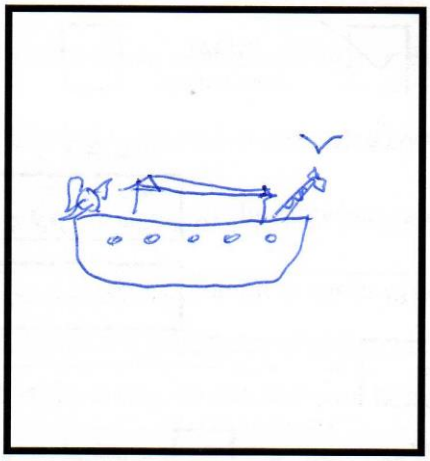


Use this box if you wish to explain your ideas.

← It's An exploding Rubbish tip.

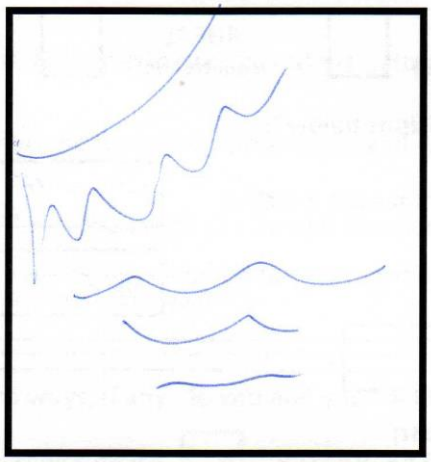


Use this box if you wish to explain your ideas.



Use this box if you wish to explain your ideas.

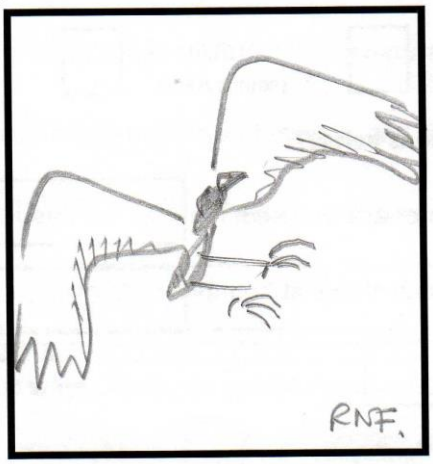
An Ark.
How High will the Sea RISE?



Use this box if you wish to explain your ideas.

BRIGHTER SUN & DANGER

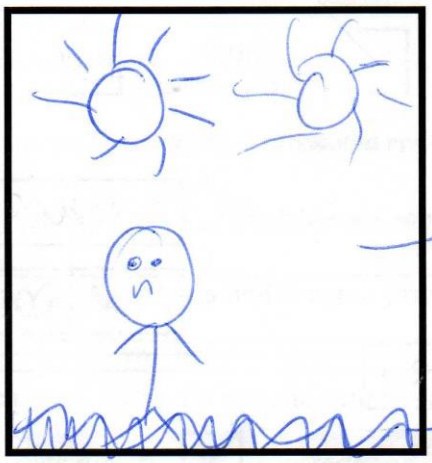
RISING TIDE!




Use this box if you wish to explain your ideas.

A NARROW BIRD

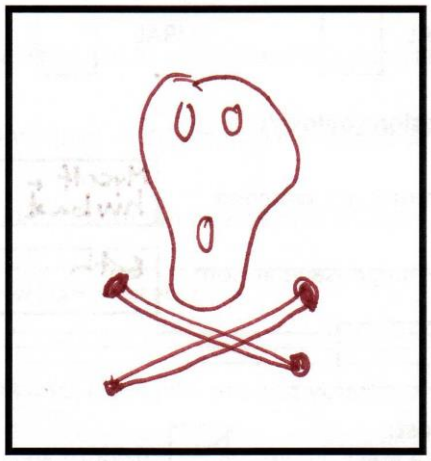
DOVE / VULTURE



Use this box if you wish to explain your ideas.

heat.

rubbish



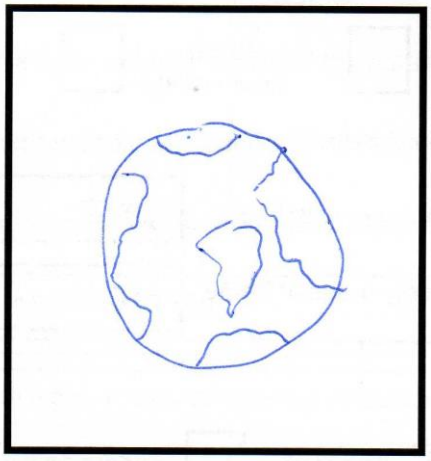
Use this box if you wish to explain your ideas.

- Danger / warning.


Use this box if you wish to explain your ideas.

Use this box if you wish to explain your ideas.

Unknown, change of our entire planet.

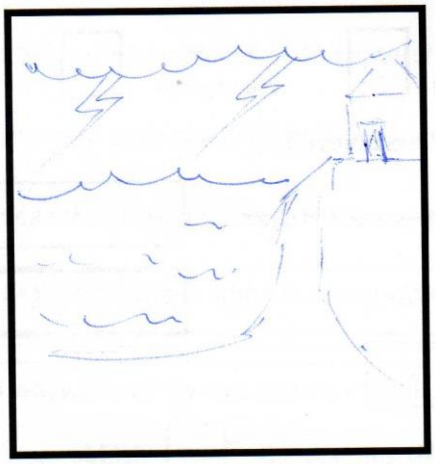


Use this box if you wish to explain your ideas.

DEAD PLANET.

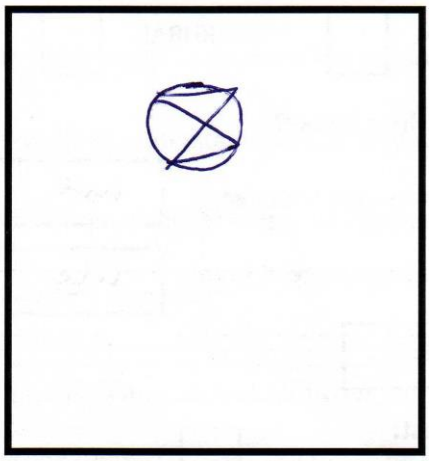
Our challenge our children's future.

Use this box if you wish to explain your ideas.



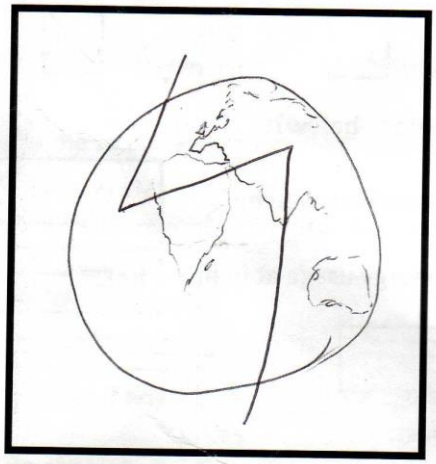
Use this box if you wish to explain your ideas.

I BELIEVE IT'S THE EARTH'S CYCLE OUT OF ICE AGE. RISING SEA LEVELS ARE A RESULT, & MORE UNSTABLE WEATHER.



Use this box if you wish to explain your ideas.

Extreme events
Extinction of wildlife

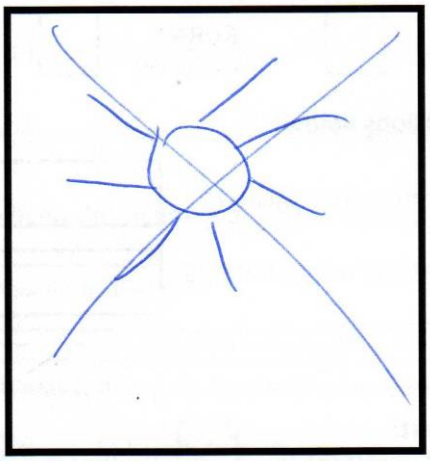


Use this box if you wish to explain your ideas.

as we know it
World is in danger of breaking up

Use this box if you wish to explain your ideas.

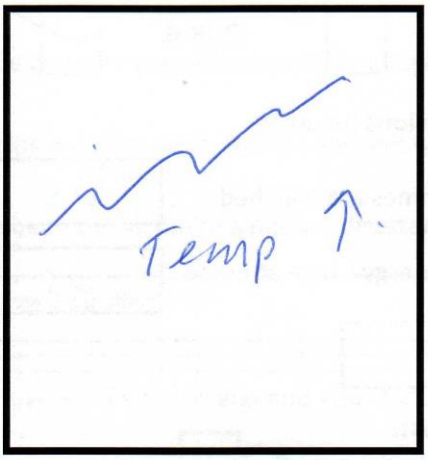
Difficult. Symbols tend to be governed by what I've already seen. Total isolation / devastation is my idea of climate change, hence the blank square! More "communicative" would be flood / starvation / w



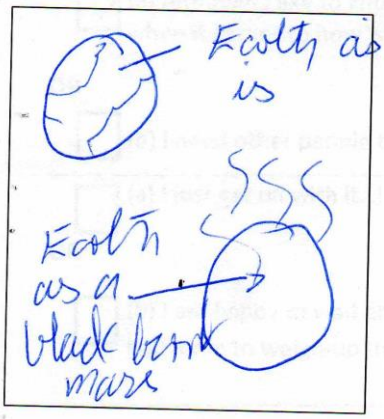
Use this box if you wish to explain your ideas.

NO

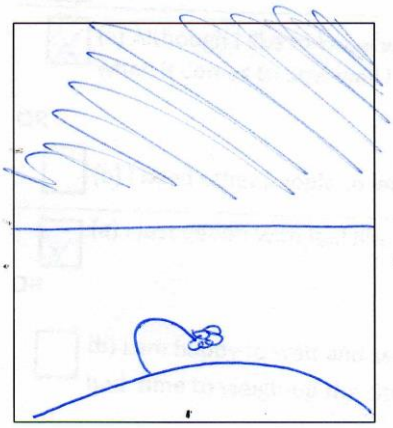
SUN




Use this box if you wish to explain your ideas.

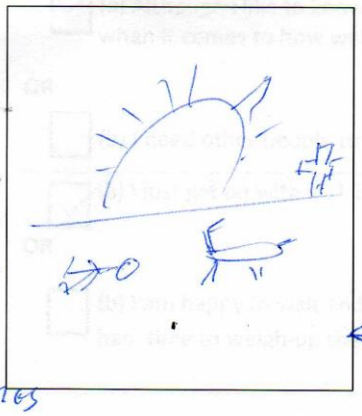



Before and after it is the listers of India. Common denominator, the needs across nations.



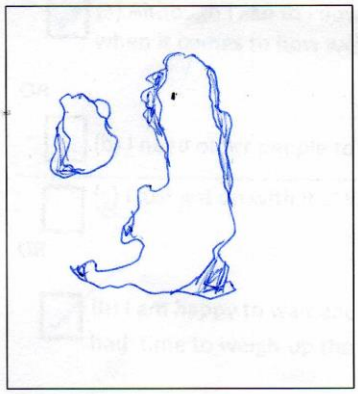
NO SUN

DEATH

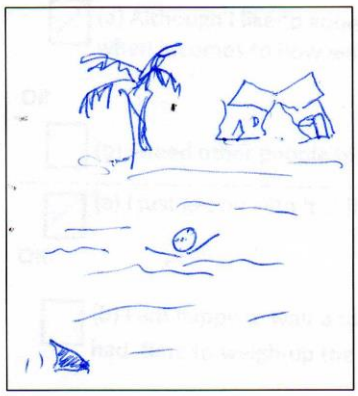


DEAD CREATURES

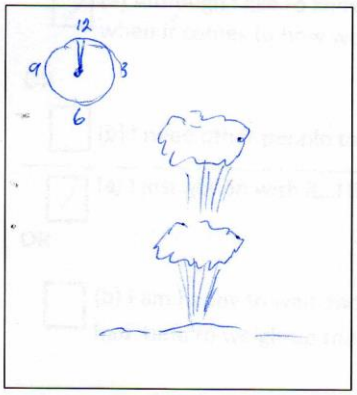
RED FOREGROUND



Shaded area in the ~~the~~ area where the UK will be eroded from rising sea levels or engulfed by sea.

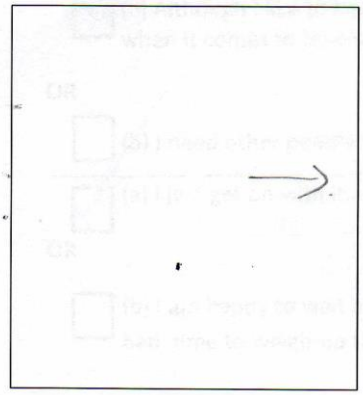


Flooding image.
Probably depicting people in developing World.

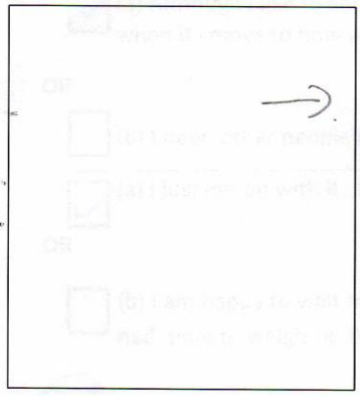



TIMES RUNNING OUT

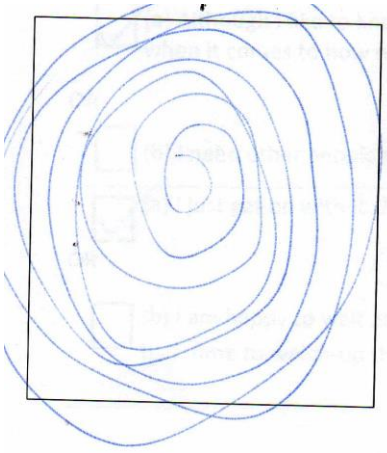

I can't draw, but I could have a picture of the world on fire, which would symbolise the pain & suffering we will feel due to climate change.



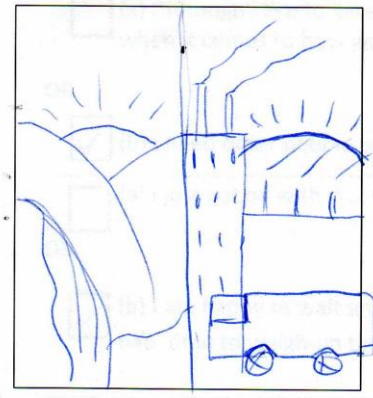
An iceberg melting - or all waste that we can't dispose off turning into toxins for the earth & the food that will then grow there



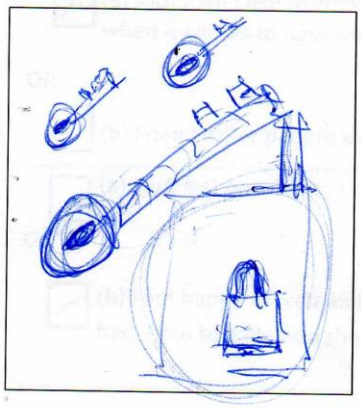
The Skeleton Coast or the Atacama Desert
~~water, water everywhere and not a drop to drink~~
" no soil fertility



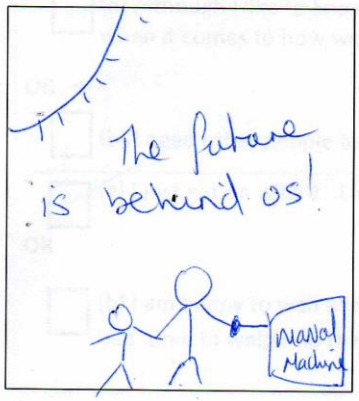
CHAOS / CHANGE / ENDINGS / BEGINNINGS - ALL IN TURNERS COLOURS / ABSTRACT - EMOTION



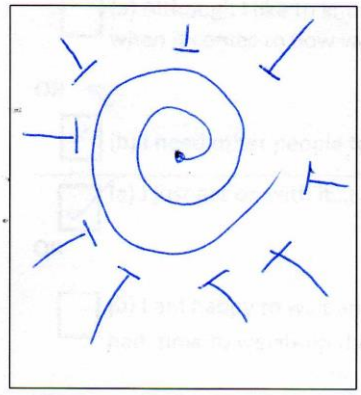
(Not the best at drawing) but a concept where you can see what our choices + industrial/technological developments are substituting + affecting.



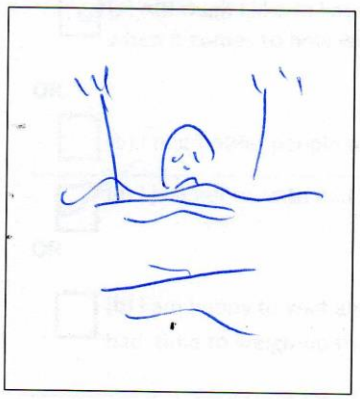
Combined effort to solve the problem, open the door open eyes. Key has an eye + padlock.



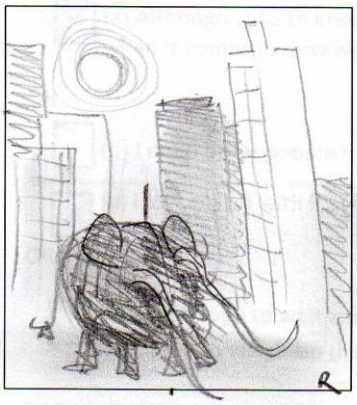

Use manpower not industry



OUT OF CONTROL
NEEDS TO BE STOPPED
BUT IS ALSO CONFUSING

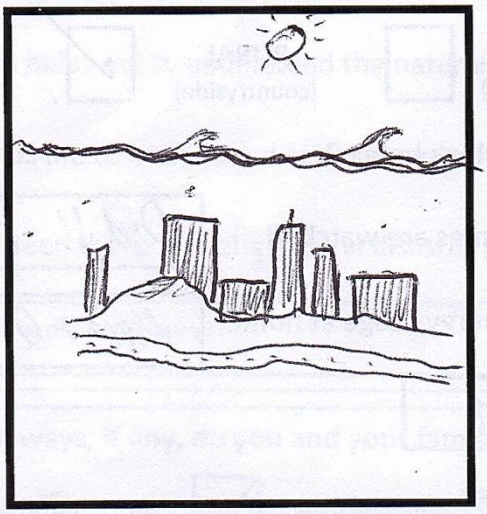


Drowning / flooding



A woolly mamoth walking through a city. The Planet is still here.

63



Use this box if you wish to explain your ideas.

"Earth?"

66

68

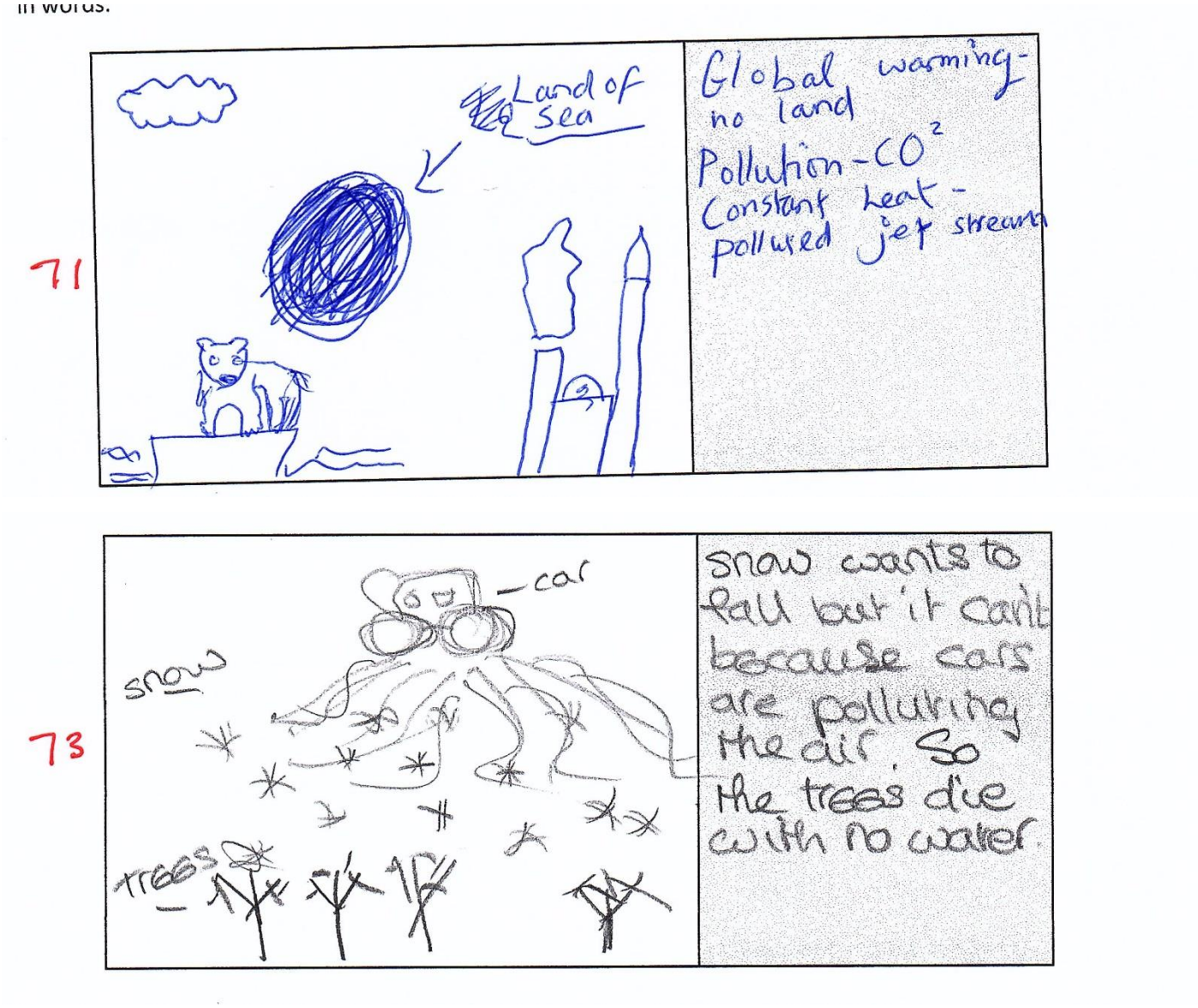
[INSERT ARTIST'S IMPRESSION OF THIS INTERESTING IDEA!]
KNF

An exhibition in 2080 with children looking at extinct animals and a map of the world as it is now (2100) compared to ~~current climate change~~ how it is now

70

Globe/planet with energy spiralling out

in words.

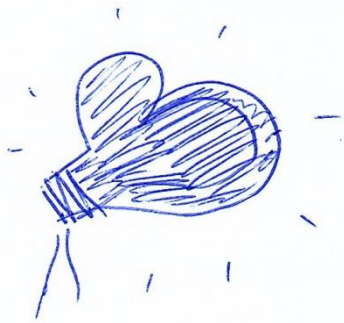



The following drawings are extracted from participants' Experiment Question Sheets:

E29

| Draw here: | Explain in words: |
| --- | --- |
|  | A world abandoned under the sea → car, houses, trees alike. fish + birds ☒ swimming around. |

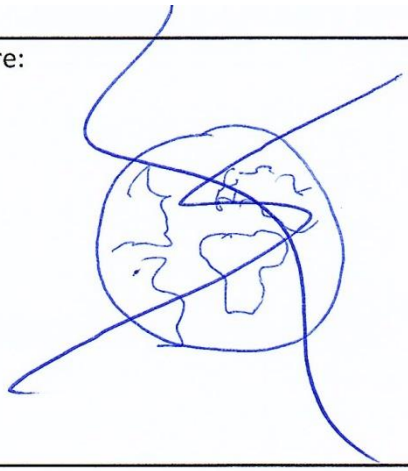
E30

| Draw here: | Explain in words: |
| --- | --- |
|  | Fighting for what we believe in. A New way = A New Day. |

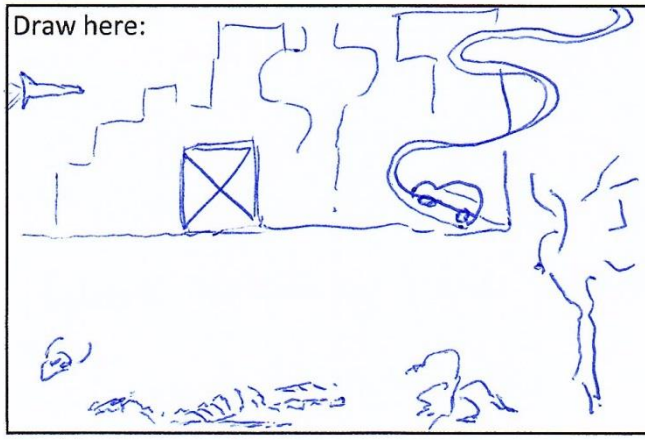
E31

| Draw here: | Explain in words: |
| --- | --- |
|  Unless there a serious rethink there will be candles to light unless + what about all the nice things such as shoes, plastics etc we need. | |

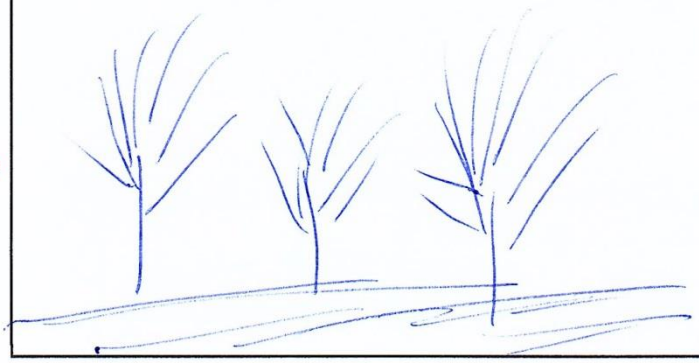
E34

| Draw here: | Explain in words: |
| --- | --- |
|  | A world potentially destroyed by forces unwittingly unleashed. |

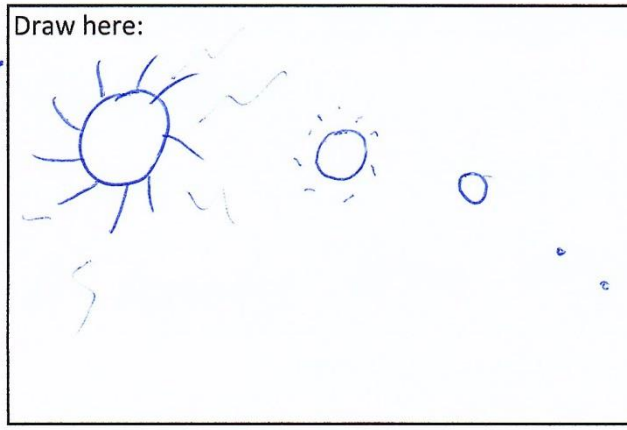
E35

| Draw here: | Explain in words: |
| --- | --- |
|  | Natural world all dead. Exclusive cities Plastic lives. Transportation to other space stations. |

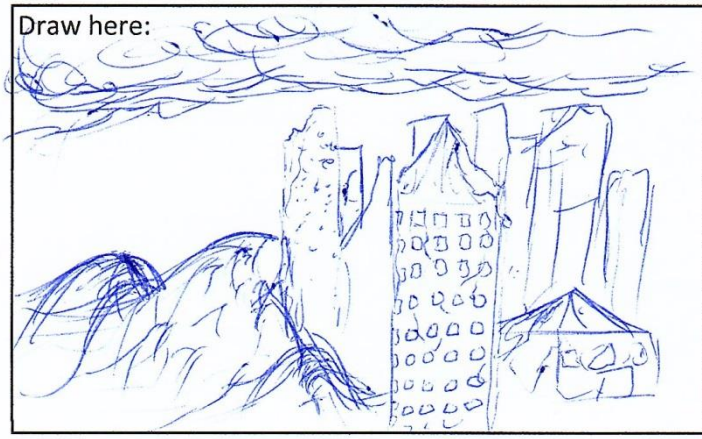
E36

| Draw here: | Explain in words: |
| --- | --- |
|  | Many feelings Not good!!! |

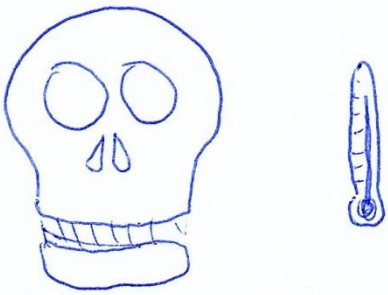
E42

| Draw here: | Explain in words: |
| --- | --- |
|  | The sun getting in Streght and affectiveness. |

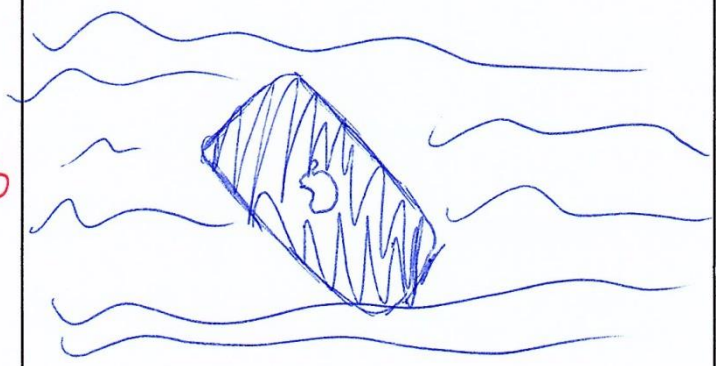
E50

| Draw here: | Explain in words: |
| --- | --- |
|  | All cities become decrepit and crumbled as the zone of climate change destroys the manmade world that caused it |

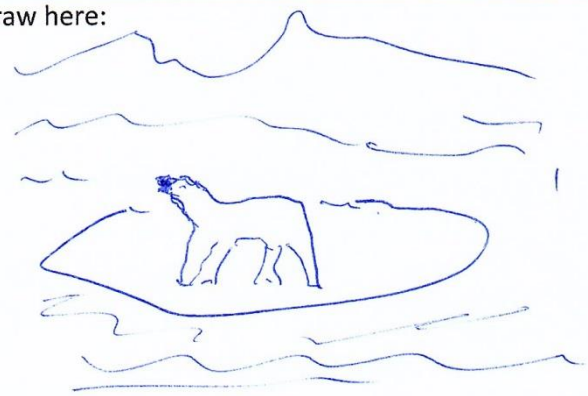
E52

| Draw here: | Explain in words: |
| --- | --- |
|  | Death of species, habitat, crops & supplies through pollution & heating up the atmosphere. |

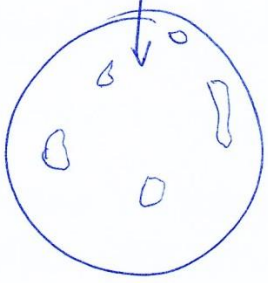
E56

| Draw here: | Explain in words: |
| --- | --- |
|  | An IPhone sinking, explaining that Nature will ALWAYS finally win. |

E71

| Draw here: | Explain in words: |
| --- | --- |
|  | The picture of the polar bear on a tiny piece of ice as all other ice melts. This says it all for me. |

E73

| Draw here: | Explain in words: |
| --- | --- |
| You are here.  | A different globe map, showing an unrecognisable land-mass + an arrow to my usual position - highlighting the fact that my little world (local) + ~~not~~ the world at large are potentially under threat. |

## 8. Climate Change Drawings by secondary school students (aged 11 – 18)

Extracted from Questionnaires.

This is a unique collection of ideas and drawings by secondary school students which aim to convey climate change impacts, collated from questionnaires 2015, within Pembrokeshire and the Dyfi Biosphere Wales, UK.

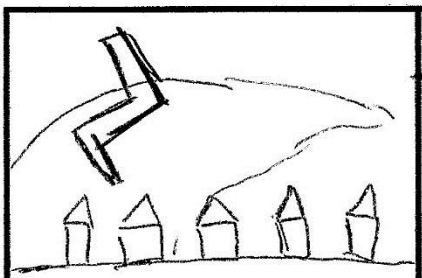
The student participants were asked to draw or explain what they visualise when thinking about climate change. The question posed was "*How would you draw climate change? Have a go at drawing what you think climate change means to our lives e.g. like Apps or t-shirt logo designs*"

Students were encouraged to express their own ideas and mainly worked independently on their responses but were permitted to confer and discuss if they wished.

Some participants could be classified as 'children' e.g. year 7 mixed ability, and others as 'young adults' e.g. the School Council. Each drawing can be linked via a serial number (available in spreadsheet format) to further information provided in the questionnaire, so that age and gender (as well as other profile information) can be related to their ideas and perceptions. For example, drawing S15 has been drawn by a fifteen-year-old girl, who rates her interest in science as ten out of ten, whereas S42 is a twelve-year-old male who rates his interest in science as five out of ten.

S3

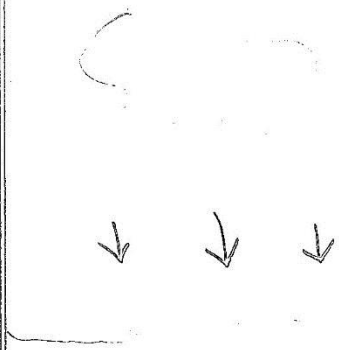
Draw:



Explain: more extreme weather, like Tsunamis and lightning, which will affect us and our homes.

S4

Draw:



Explain: Ice caps melting in north / South pole, and colder parts of the world

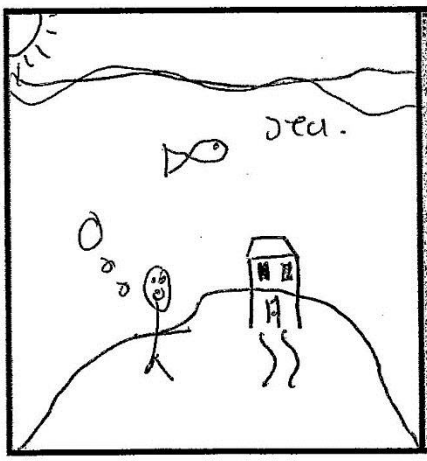
S5

Draw:

Explain: animals migrating due to warm weather e.g mosquito

S6

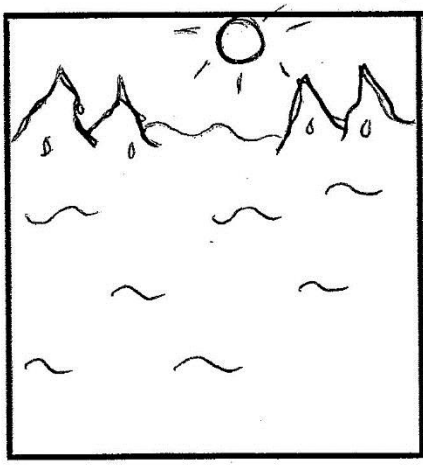
Draw:




Explain: Because the ~~the~~ world's temperature is increasing every the sea levels are rising and soon the land might be submerged in water

S7

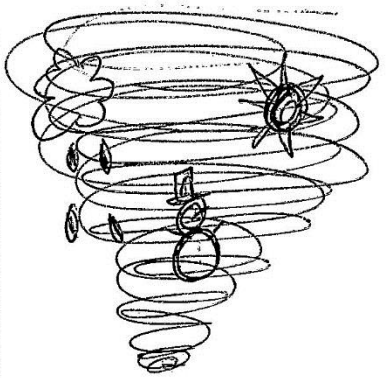
Draw:



Explain:
In the picture we see the water levels increasing and ice-caps melting due to increase in the temperature

S9

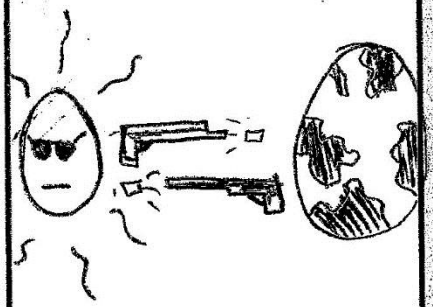
Draw:



Explain:
Natural disasters are very frequent and they are often unpredicted much like the weather these days

S10

Draw:

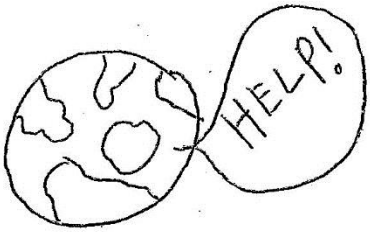


Explain:

The sun is killing our world! and we are killing the atmosphere!

S11

Draw:

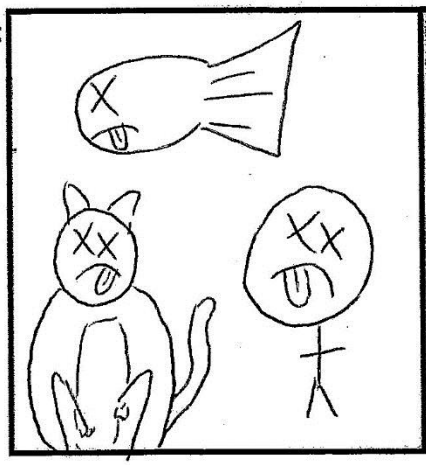



Explain:

We need to help the world, it is our fault

S12

Draw:

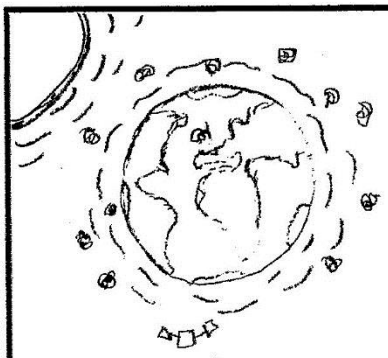


Explain:

Everything is dead

S13

Draw:

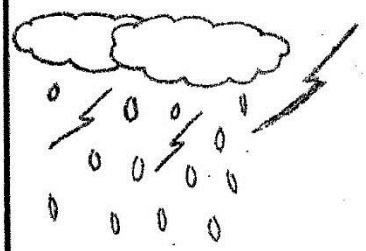


Explain:

The Earth will have an alarmingly increasing temperature, and all the waste humans produced will event-ually end up in space.

S14

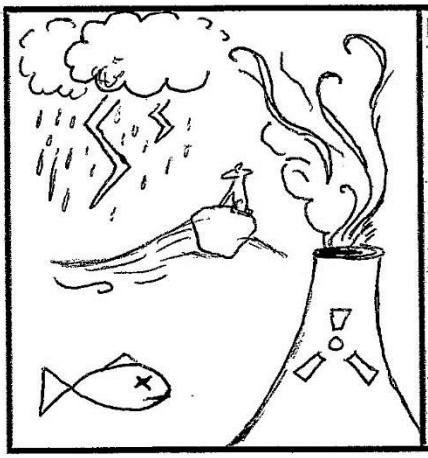
Draw:



Explain: I see storms, wind, lightning and darkness when thinking about climate change.

S15

Draw:

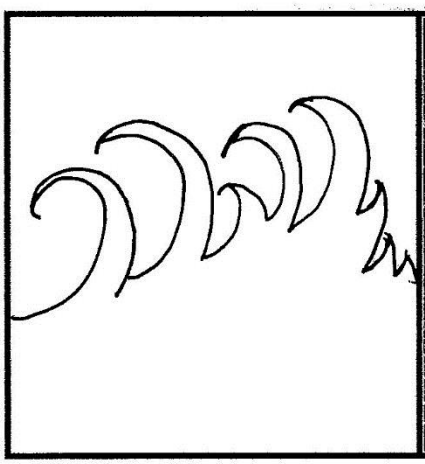


Explain:

When I think of climate change, I think of pollution and non-renewable energy. I also think of extreme weather, and sea levels rising and polar animals struggling to survive.

S16
TEACHER.

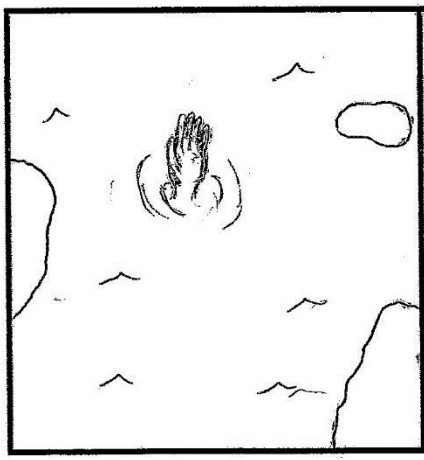
Draw:



Explain:

S17

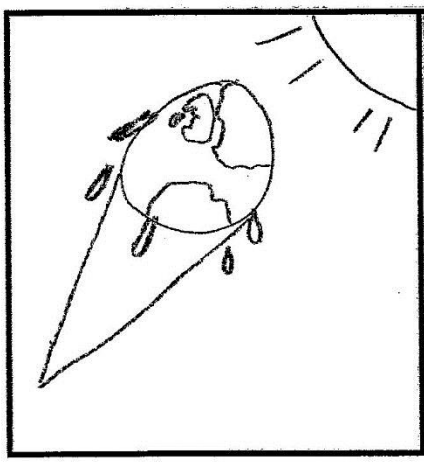
Draw:



Explain:
A hand to symbolise a person drowning as a result of risen sea levels, and melted ice (ice caps)

S18

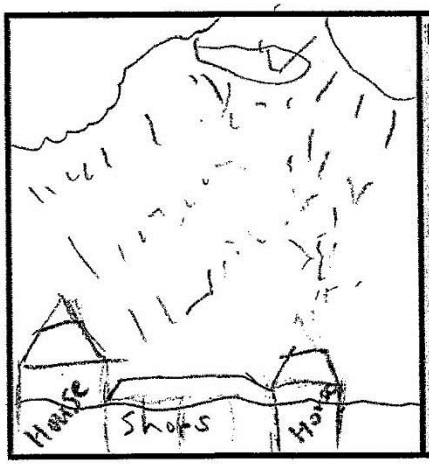
Draw:



Explain: Our Planet is heating up and our ice caps are melting.

S19

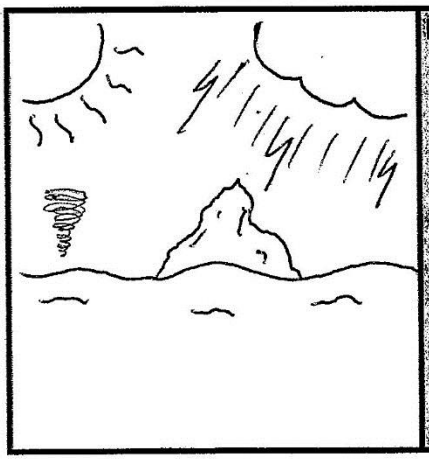
Draw:




Explain: Houses and businesses afected by the climate change. Flooding = Affect on buisness etc... = Less money for the buisnesses = buisnesses close down = Less tax for the Goverment = Less money for development to the local area.

S20

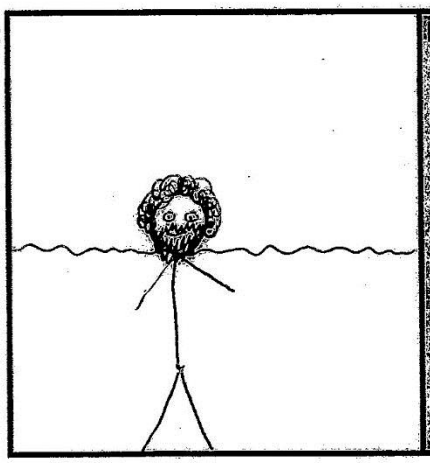
Draw:



Explain: The earth will have more extreem wather and higher likelyness of flooding will cause more deaths

S21

Draw:



Explain: We don't want to end up like this

S 22

Draw:

Explain:

The sun is scorching and burning the land into a wasteland, while waves cost peoples lives and put people in danger

S 23

Draw:

Explain:

The heat is rising causing huge wild fires.

S 24

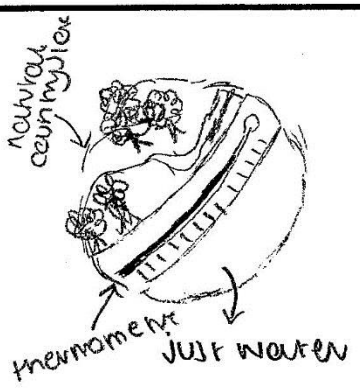
Draw:

Explain:

Fire should be in a fire place' not setting the world on fire.

S25

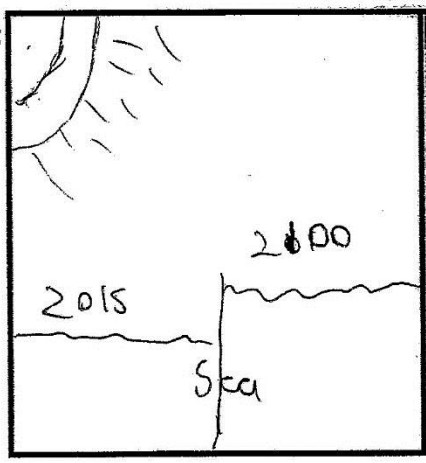
Draw:




Explain:
The top of the world is covered in trees, greenery, riven and animals, which is what the water is about, nature and beauty. However the middle is a thermometer showing the rising temperature and the pattern is the conclusiveness of the rising sea level.

S26

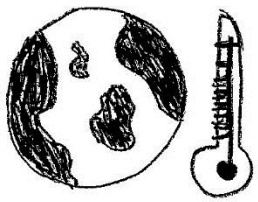
Draw:




Explain: Rapidly rising Sea levels that can destroy communitys

S27

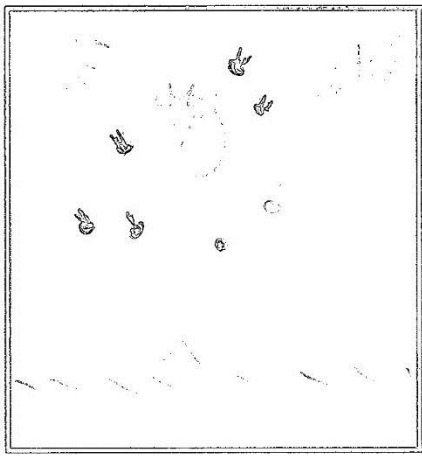
Draw:



Explain:
The world is getting ~~hot~~ warmer because the $CO_2$ cannot get out

S 28

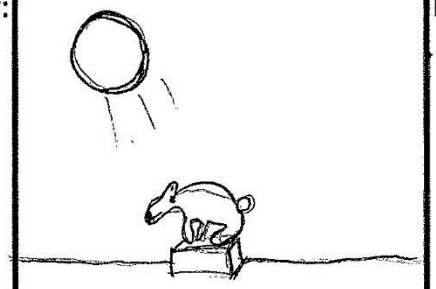
Draw:



Explain: House blowing in the wind = more extreme weather. Slight increase in heat → result in an increase in the prevelence of HIV/AIDS/ MALARIA as a result of bugs carrying it around.

S 29

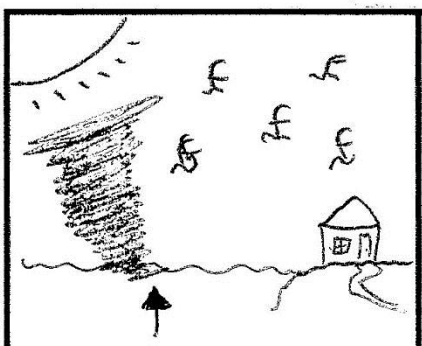
Draw:



Explain:
... There is a polar bear sat on an ice cube as all the ice is melting. He has very little food and dry land is out of reach. He will not last long.

S 30

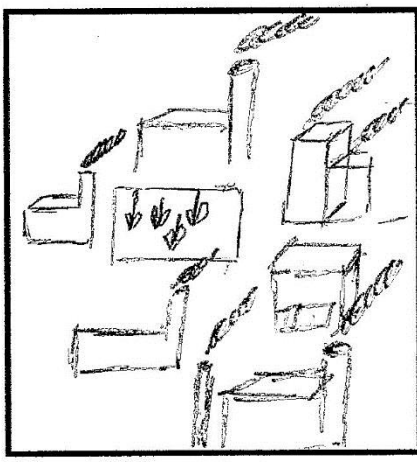
Draw:



Explain:
The effects of climate change environmentaly with for example rising sea levels leads to our economy loosing money and loosing their belongings. Aswell as this results the tornado pulling money out of the countries economy.

S 31

Draw:

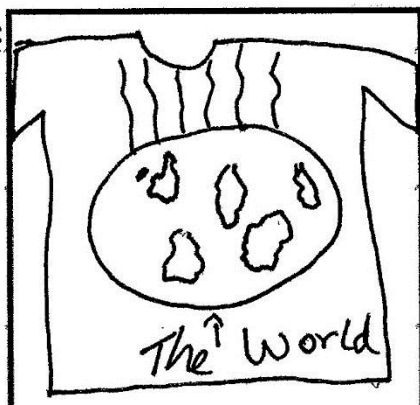


Explain:

Industry closing in on the environment extracting its limited fossil fuels that are left releasing ~~harmful~~ ~~harmful~~ harmful gasses into the atmosphere.

S 32

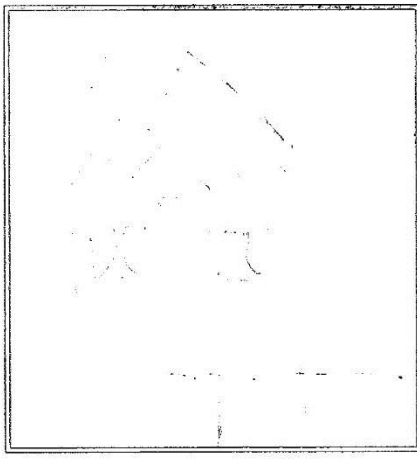
Draw:




Explain: The long lines are the heat coming from the planet. This explains global warming.

S 33

Draw:

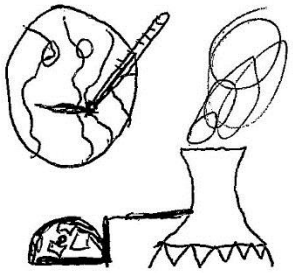


Explain:

Here is a picture of a this can effect our climate which leads us to a change

S 34

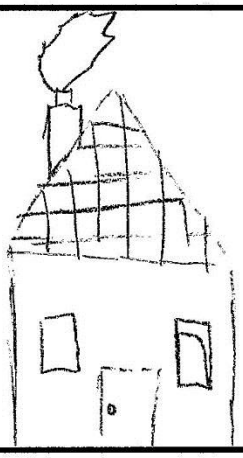
Draw:



Explain: Endangered that is damaging the environment and causing the planet to heat up. causing more extreem weather and a harsher place in which to live.

S 35

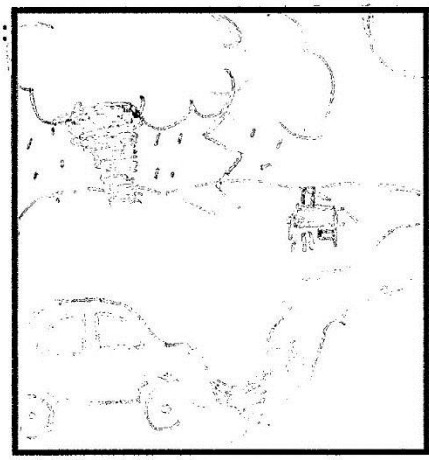
Draw:



Explain:
Here is a picture of gases Coming out of a house which effect our climate, which leads to a change.

S 36

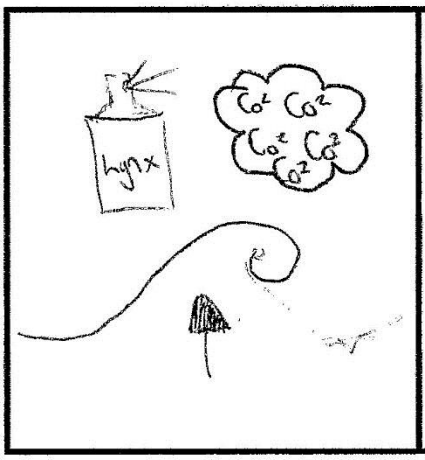
Draw:



Explain:
The car represents all the pollution that we as humans release into the atmosphere. The varied weathers are ~~an effect of~~ consequences of our behaviour.

S 37

Draw:

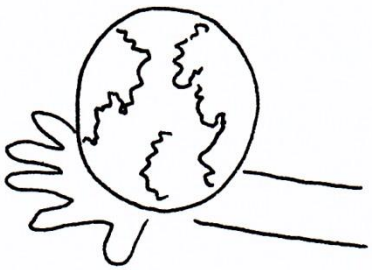



Explain:

This diagram shows that the sea levels are rising and more gasses are getting in to the atmosffes such as Co2.

S 38

Draw:

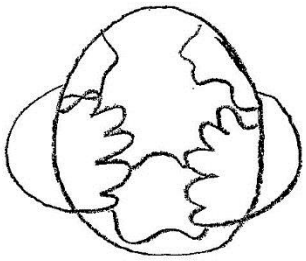


Explain:

The world is in our hands - we make the decision whether to take care of it or not.

S. 39

Draw:

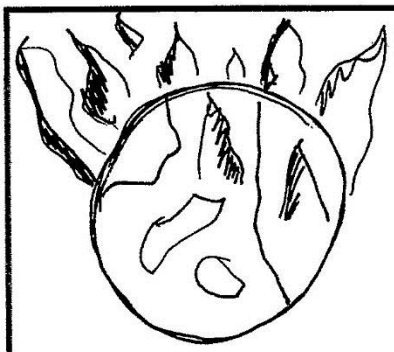


Explain:

It's up to us to make a difference - it's in our hands.

S40

Draw:

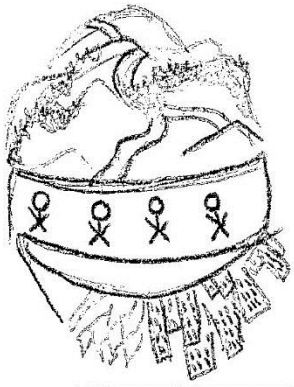


Explain:

climate change means loosing the earth through ~~over~~ the things that have been forced by humans such as releasing dangerous gases to the air.

S41

Draw:

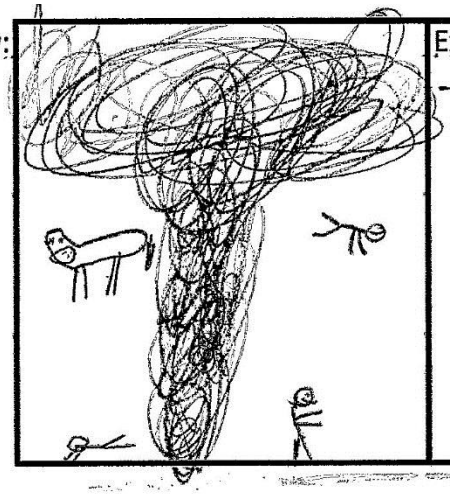


Explain:

The top D the world before climate change, nowrdd, green, beautiful, however after the humans how forced gasses are industrialization upon the world ruining it.

S42

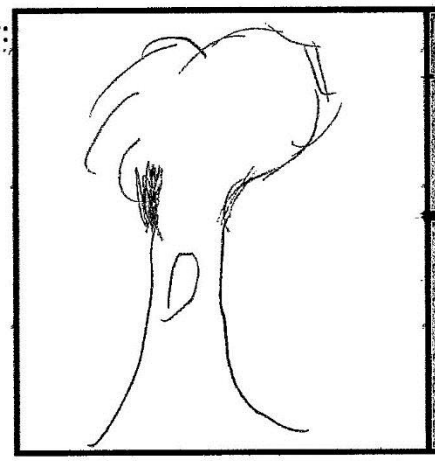
Draw:



Explain:

S43

Draw:

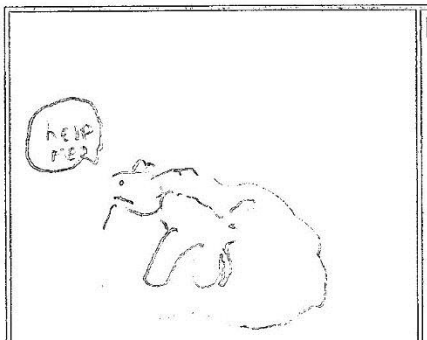


Explain:

a tree

S44

Draw:

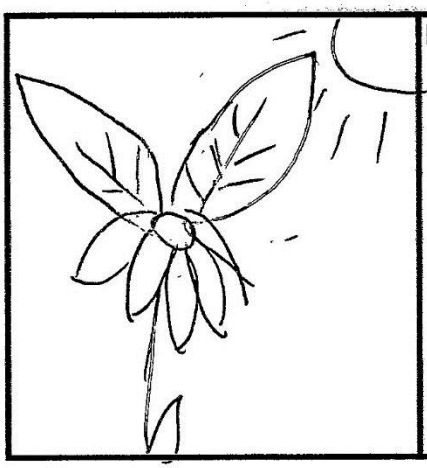



Explain:

This is a picture of a stranded polar bear stuck on some ice because of climate change

S45

Draw:

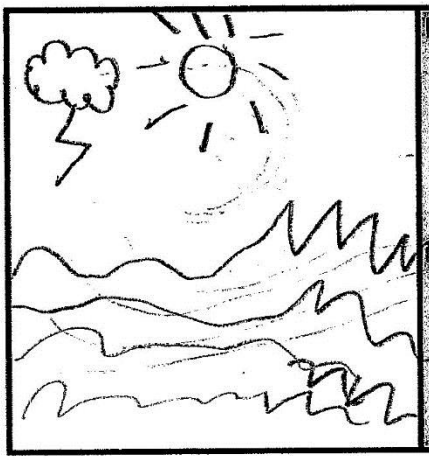


Explain:

This is a dying flour that represent pollution too the enviorent.

S46

Draw:

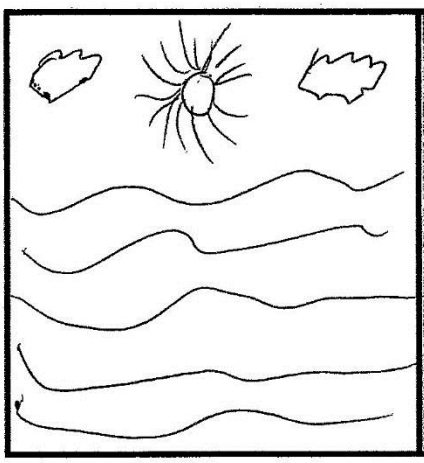


Explain:

Weather change

S47

Draw:

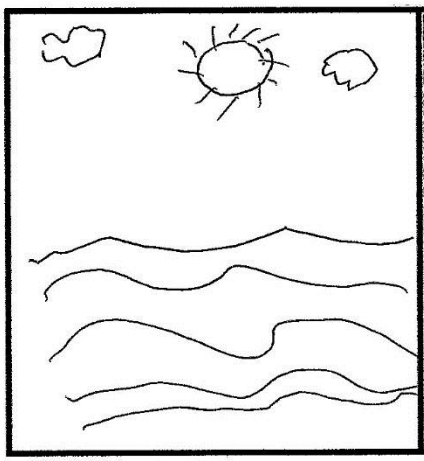


Explain:

weather change

S48

Draw:



Explain:

S 49

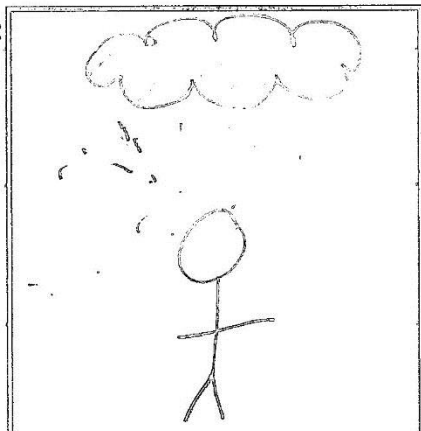
Draw:

Explain:

I think climate change is the weather so this stick man is holding a umbarella cause of the wind.

S 50

Draw:

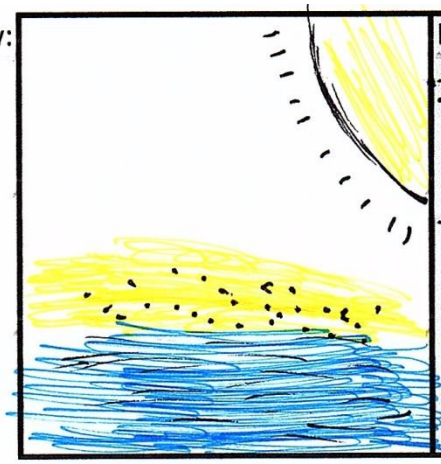


Explain:

A stik man in the ~~wr~~ rain.

S 51

Draw:

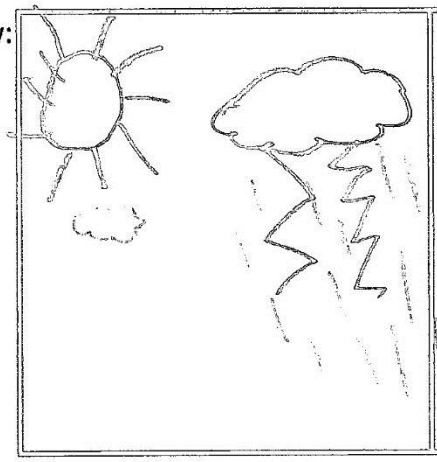


Explain:

the wether change's.

S S2

Draw:

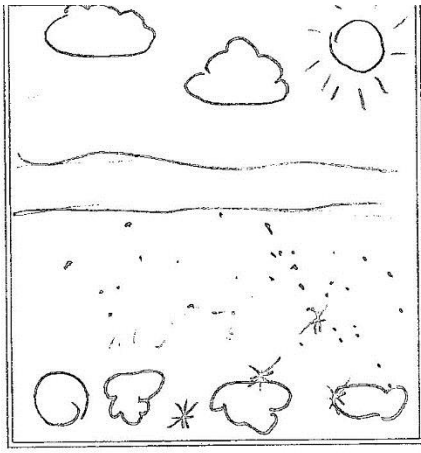


Explain: when we have thunder things can get wrecked and that can effect us.

= Weather Change.

S S3

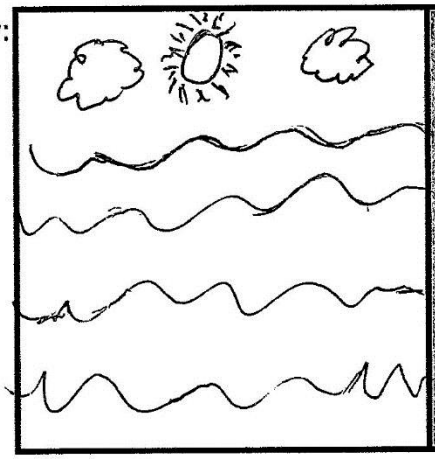
Draw:



Explain: This shows the day (with sunny weather) and the night (with bad rainy weather)

S S4

Draw:

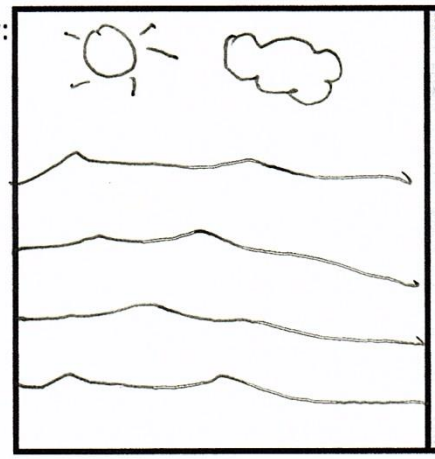


Explain:

Weather change.

S 55

Draw:

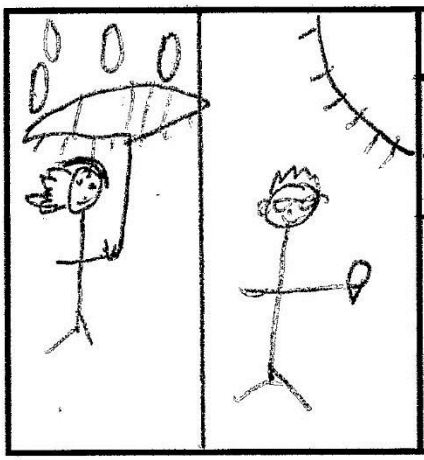


Explain:

weather change.

S 56

Draw:



Explain:

I think climate changes the weather like storms.

S 57

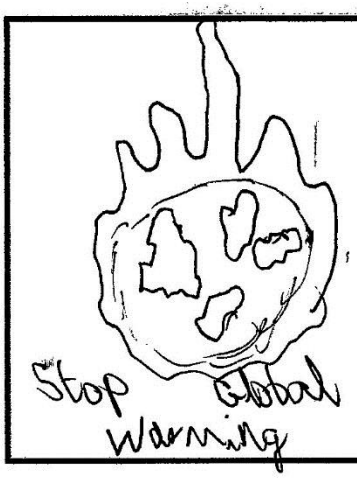
Draw:


Explain:

this polar bear is stranded on a tiny ice berg in the middle of the sea we must save our planet before climate change it for us.

S 58

Draw:

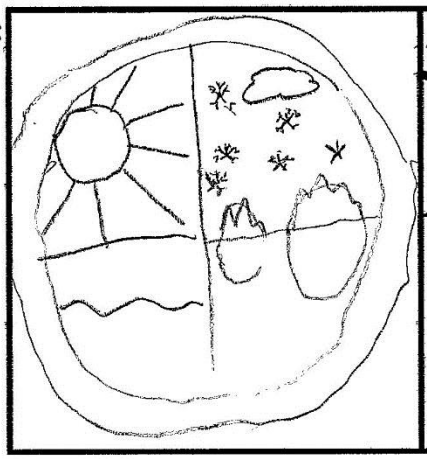



Explain:

Stop global warming because we are getting freak floods, melting Polar Ice caps an even wild weather

S 59

Draw:

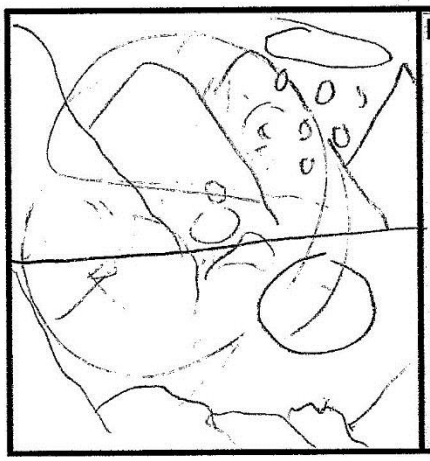


Explain:

This is an ~~exaple~~ example ~~of~~ of a weather change. This It is down to global warming.

S 60

Draw:

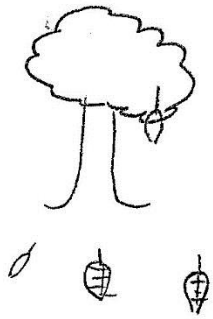


Explain:

This is an exaple of climet change

S 61

Draw:



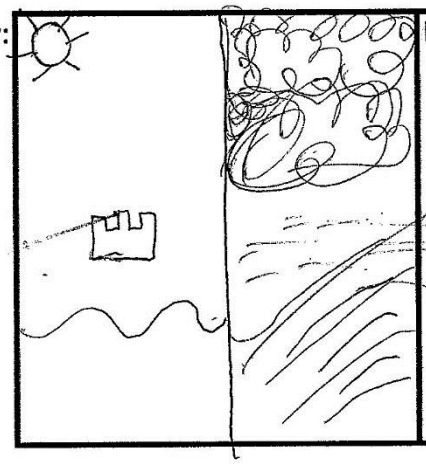
Explain:

Polution in the air

leaf's falling into the spring not autum caused to global warming

S 62

Draw:

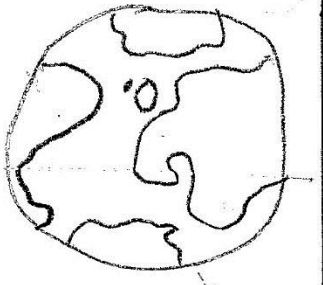


Explain:

Weather change

S 63

Draw:



Explain:

Ice freezing and Sea going colder

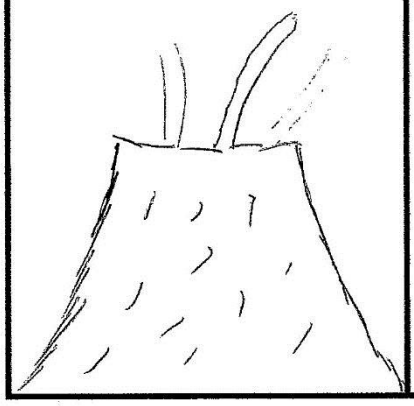
S 64

Draw:

Explain:

S 65

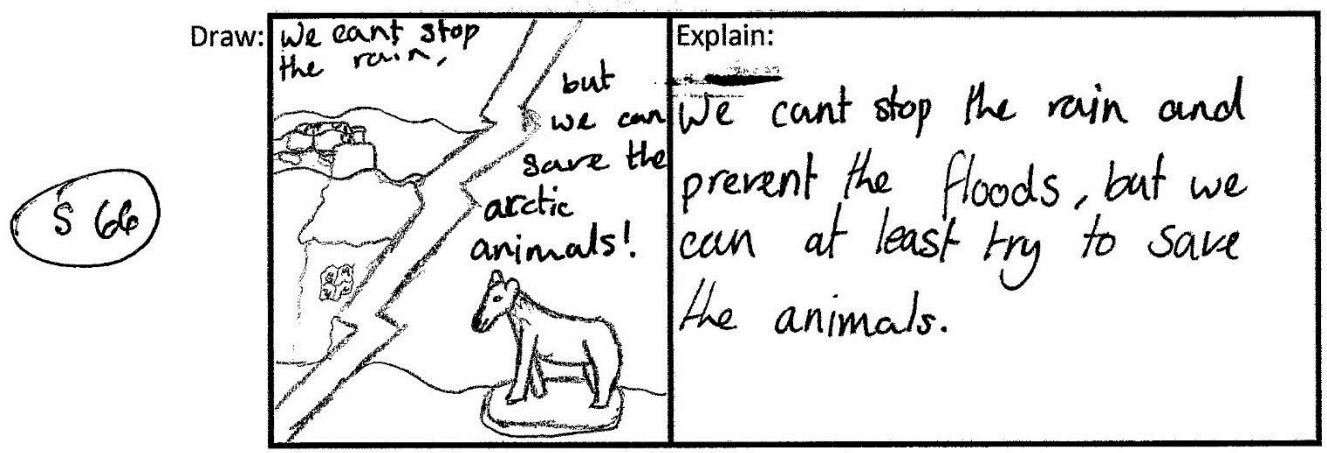
Draw:



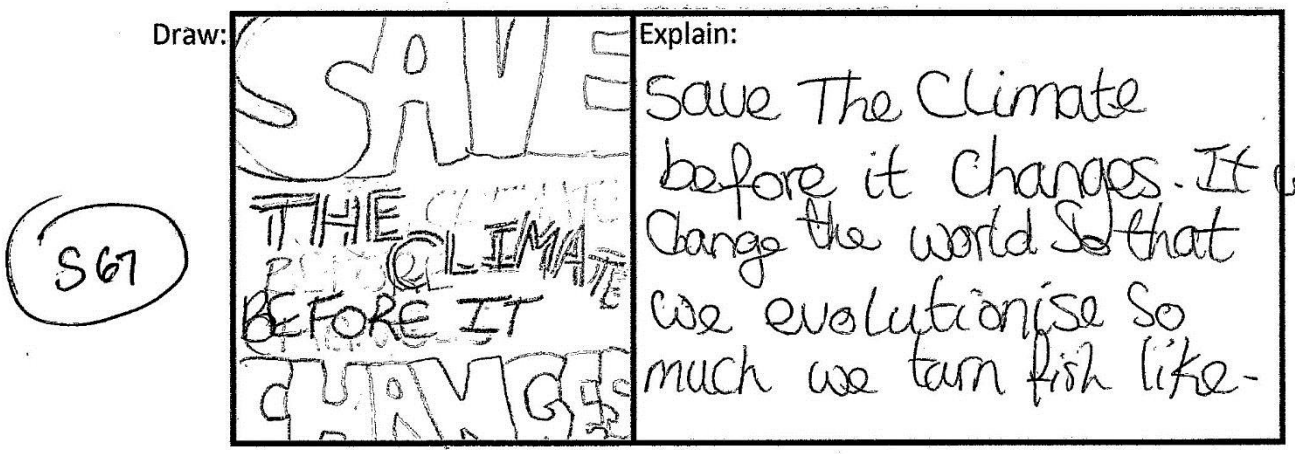
Explain:

This is about the volcanos erupting in different places effecting our environment

(PTO)



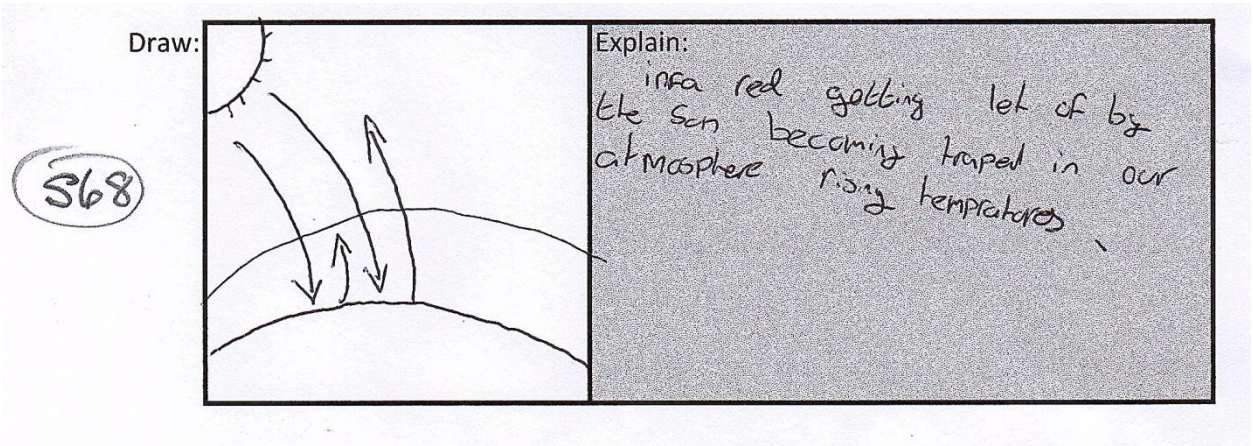

S66




S67

---

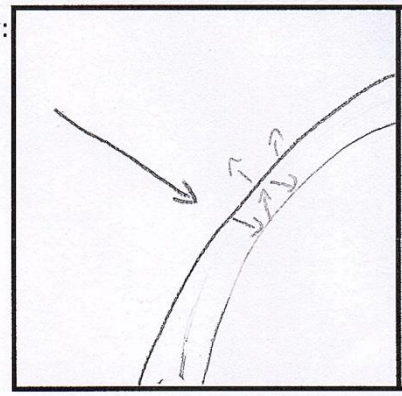
The following drawings were extracted from questionnaires completed by pupils of Ysgol Bro Hyddgen, Machynlleth, within the Dyfi Biosphere (July 2015).




S68

S69

Draw:

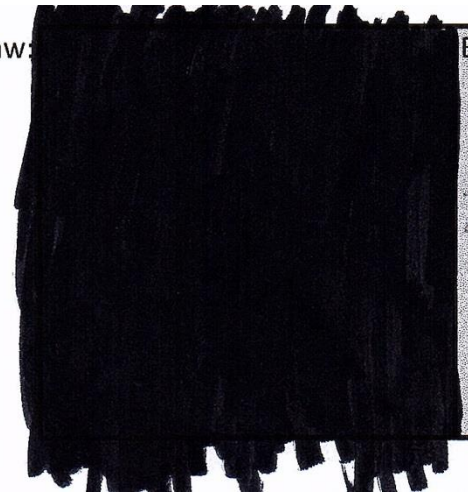


Explain:

~~Tonnau~~ ~~dwis~~ Info-red waves get into the earth atmosphere and heat it but then can not escape and therefore cause global warming.

S70

Draw:

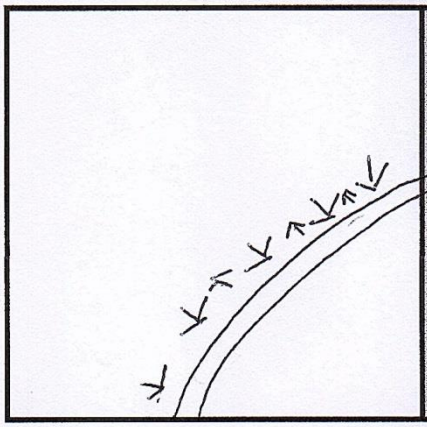


Explain:

1. Darkness because of no power, fuel, resources.
2. Darkness because of more ~~ma~~ gasses ~~trig~~ polluting the atmos
3. Darkness because of the obliteration of the human race and p

S71

Draw:



Explain:

Infared waves get stuck inbetween the earth and atmosphere

S72

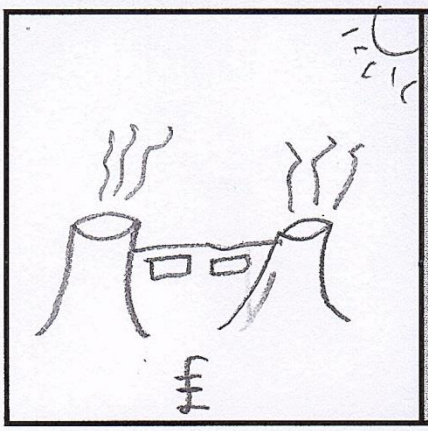
Draw:


Explain:

The drawing is the process of the Earth getting too hot and everything dieing

S73

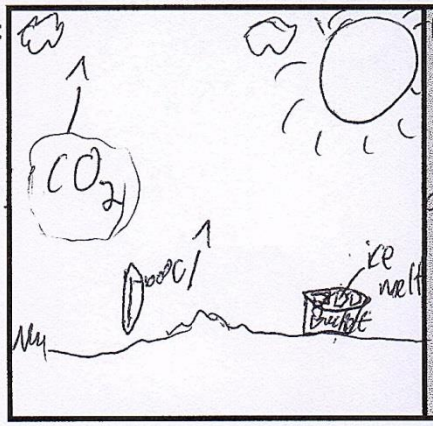
Draw:




Explain: Money and electricity and wealth use ~~gas~~ burns power stations which create $CO_2$ which trap ~~UV~~ infa red rays in the earth's atmosphere and then raises the temperature.

S74

Draw:



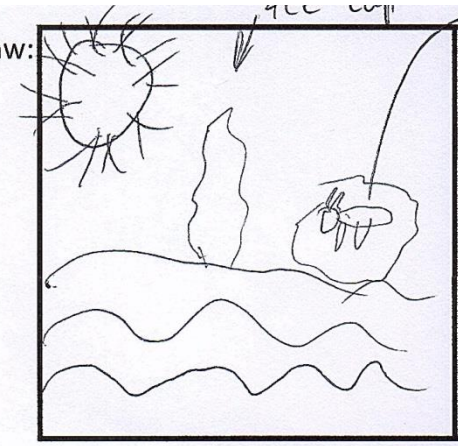

Explain:

$CO_2$ goes into the air, breaks O-zone layer, increases heat of world* and all ice melts,

*cosmic rays can't escape through the o-zone layer.

S76

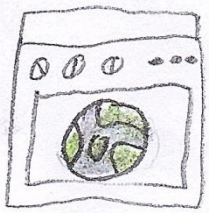
Draw:



Explain: This image is of the ice caps melting which causes the sea levels to rise, which then cause animals habitats e.g polar bears to lose there habitats and even lose there lives this causes extinction to happen.

S.76

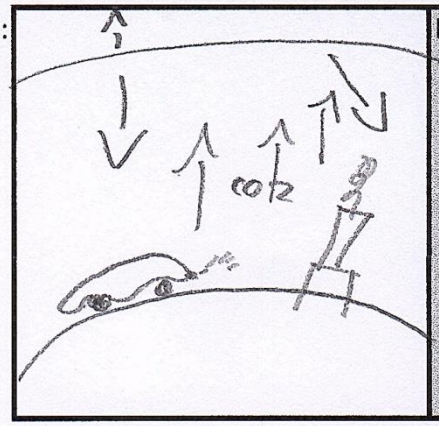
Draw:



Explain: through global warming the earth is being heated up like a pie in the oven.

S.77

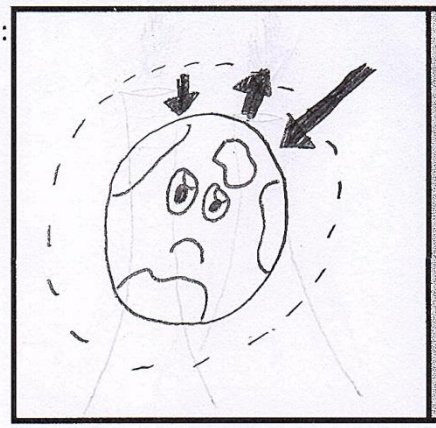
Draw:




Explain: $CO_2$ is released by cars and factories most of it reflects back off the ozone and heats up the atmosphere.
- Ice caps melt
- Sea levels rise
- drown

S.78

Draw:

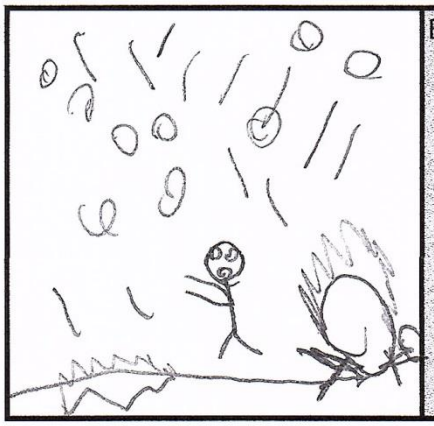


Explain:

Sun infared rays getting typed in the Earth atmosphere

S.79

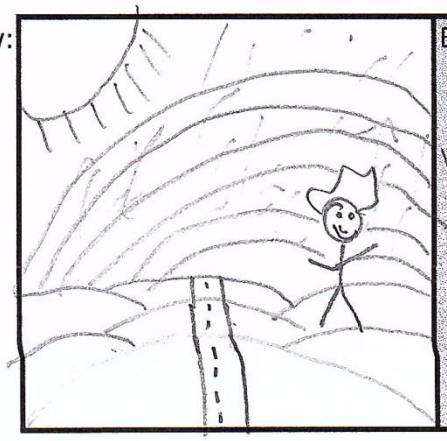
Draw:



Explain: rine fiev balls hail fiers

S.80

Draw:



Explain: it is sunny and raining with a rain-bow.

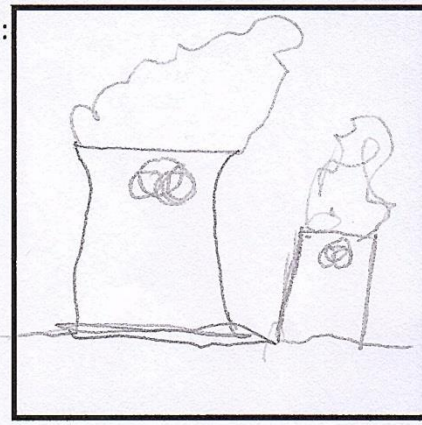
S.81

Draw:

Explain:

S.82

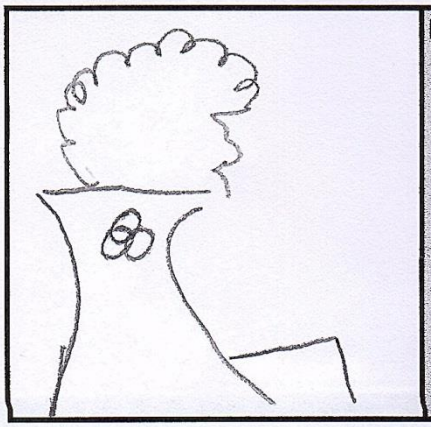
Draw:



Explain: The smoke is Pollution in the air.

S.83

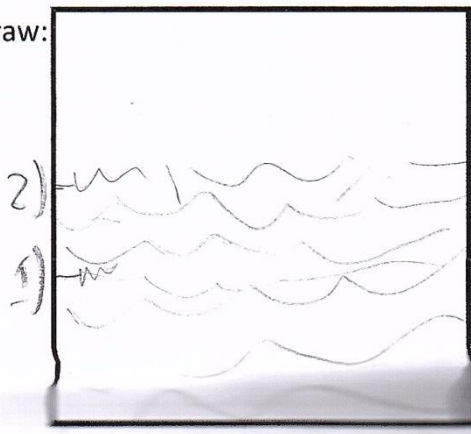
Draw:



Explain: The smoke id going into the sky

S.84

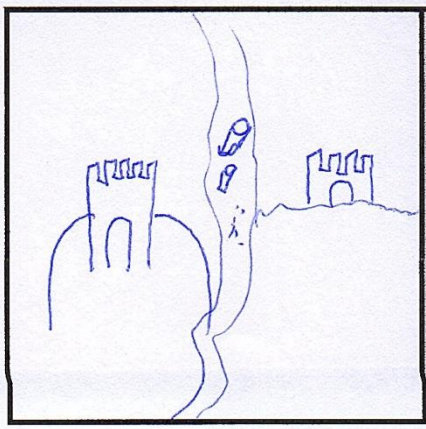
Draw:




Explain: The first line shows ~~where~~ how deep it is before and the second show that it is now

S.85

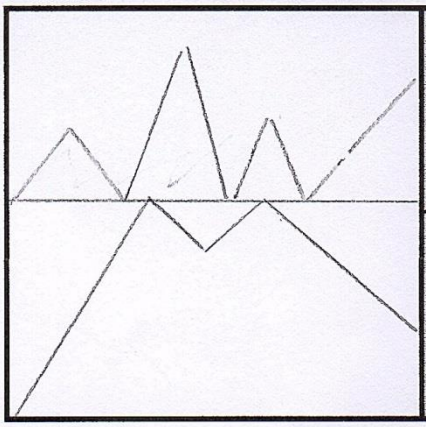
Draw:



Explain: Left = Before
Right = After

S.86

Draw:

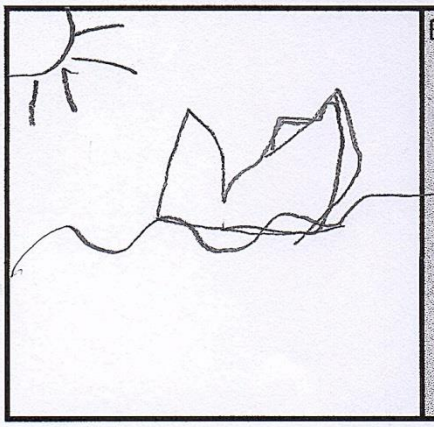


Explain: this was it befor Litering and that

this is now which people walk Lizard.

S.87

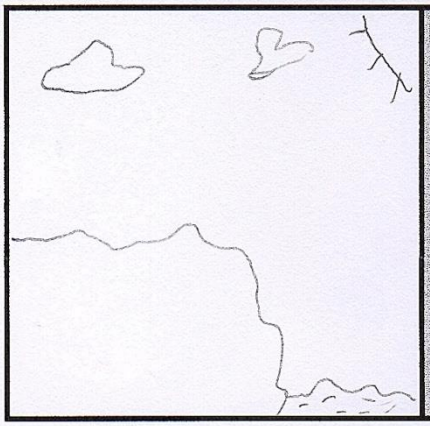
Draw:



Explain: The water levels will rise because of Ice bergs melting. They are melting because of ~~climate~~ than global warming which is caused by our pollution

S.88

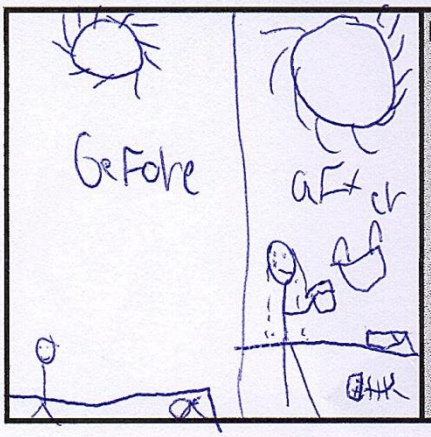
Draw:



Explain: Ice is melting from the hat and water levels rise because global warming is making it hotter

S.89

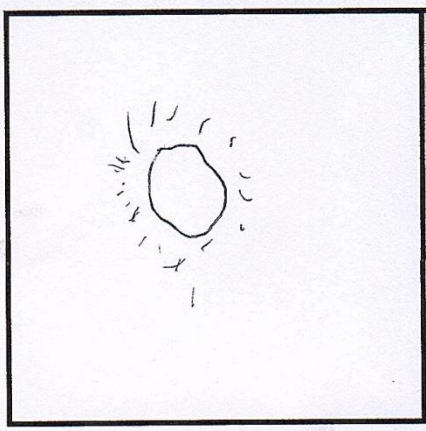
Draw:




Explain: it gets a lot hotter because of pollution

S.90

Draw:



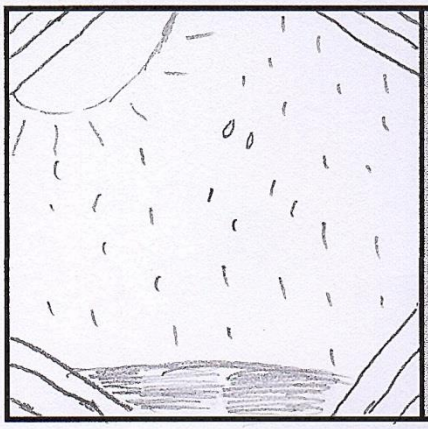
Explain:

mae haul yn cynhesu
wrth yr hynsawdd

The sun gets stronger as the climate changes.

S.91

Draw:



Explain:

when i think of climate change this is what i think of sea. rain and sun.

S.92

Draw:

Explain: The pink shows the heat engulfing the world.

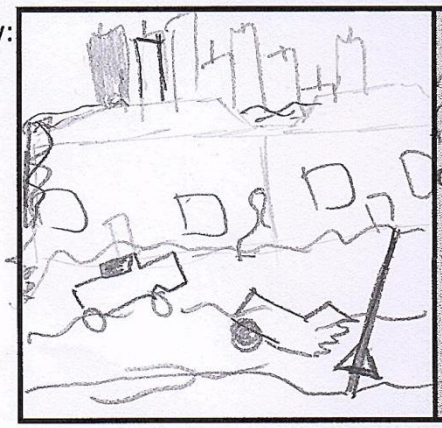
S.93

Draw:

Explain: The red show all the heat coming into the world

S.94

Draw:



Explain: This is a picture showing how climate change can cause flooding and destroys homes and towns.

S.95

Draw:

Explain: That a lot more amount of the weather will change, so higher sea levels, longer light and heat more rain, lightn

S.96

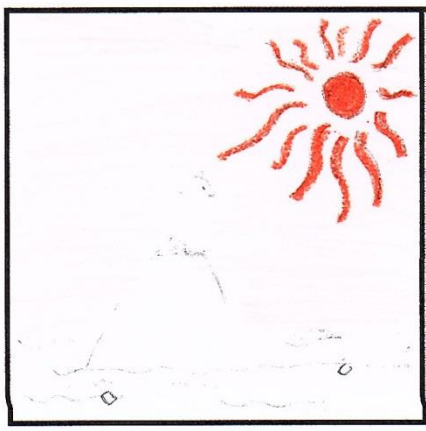
Draw:

Explain:

It shows a graph changeing as the weather changes.

S.97

Draw:



Explain: A polar bear on a melting ice berg, into a dirty sea.

S.98

Draw:

Explain:

The earth is getting hotter

S.99

Draw:

Explain: the blgining of the end of the word

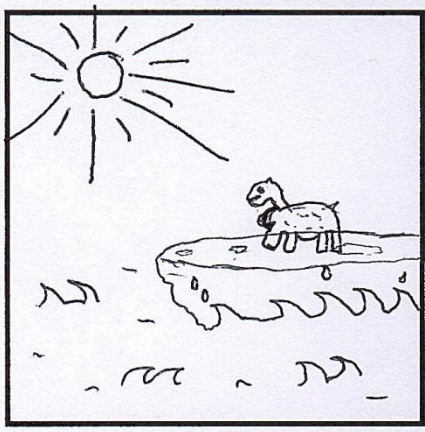
S.100

Draw:

Explain:
The lines are global worming and it slowly starts surrounding the earth.

S.101

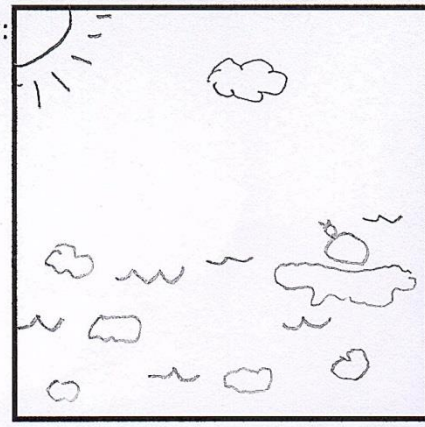
Draw:



Explain:
I have drawn a polar bear standing on an ice berg which was mealting in the hot sun. It probably die because the ice berg was mealting.

S. 102

Draw:

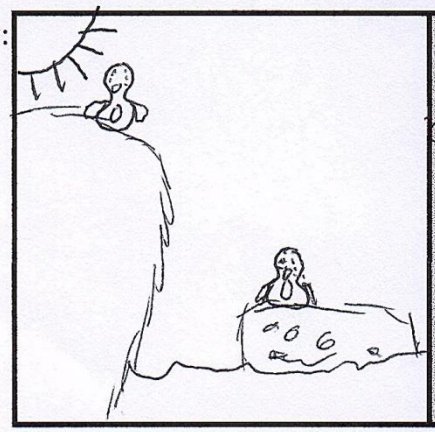


Explain:

This is meanimes land being melted because of the global warming

S. 103

Draw:



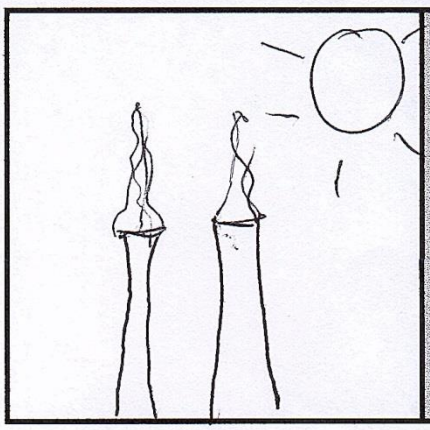
Explain: ~~The~~ north pole melting ~~and~~ and make penguins and south bear can't have no home

Draw:

Explain:
This shows the ice melting which is global warming.

S. 104

Draw:



Explain: Perception: warmer climate. industrial pollution although we should remember the causes + consequences are much broader.

S. 105